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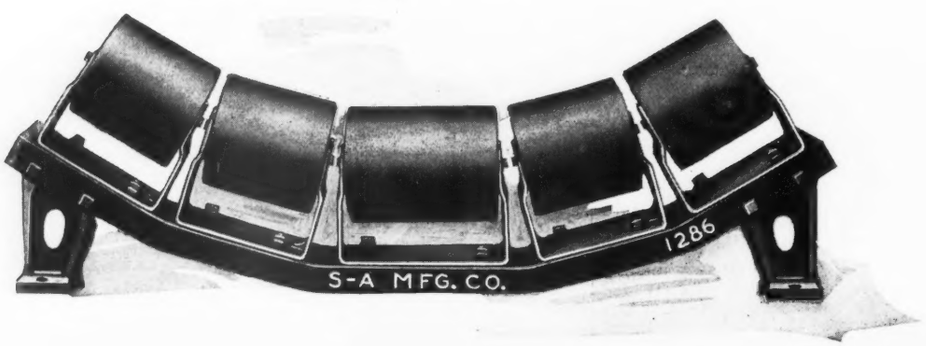

ENGINEERING AND
MINING JOURNAL-PRESS

JOSIAH EDWARD SPURR, Editor

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The Petroleum Warfare in Persia

THE RECENT MURDER in the capital of Persia of the American Vice-consul, Major Imbrie, has drawn attention sharply to the bitter nature of the struggle which for years has been going on between American and British interests for the possession of oil fields. A few years ago the subject received much needed publicity in the United States, and *Engineering and Mining Journal* carried a number of editorials dealing with the situation. Then, especially as it appeared that the focusing of attention on the problem might be productive of unnecessary ill-feeling between the two countries, the matter was dropped by common consent. But that the commercial interests which are reaching out for oil in both countries are continuing their system of buccaneering finance, aided where necessary by government action, has been manifest in nearly every step of European politics.

Major Imbrie was killed by a mob in Teheran, the report being that it was because he was photographing a religious festival. That the explanation of his murder is more subtle is a view expressed by many Americans and British familiar with the field. A dispatch from Paris stated that a former British secret service agent attributed the murder to "financiers in the United States and England who thought his influence might swing control of the Persian oil fields" from the British control to an American company. An "important officer of an American oil corporation" went even further in commenting on the situation. As reported in the daily press, he said:

"There has been a life and death struggle for the control of the Persian oil fields for the last ten years or more, and any one familiar with conditions in Persia knows that murder has been resorted to. The struggle has been between American and British interests. All the fields in southern Persia are in the hands of the Anglo-Persian Corporation. In the north an American company, acting for the Anglo-Persian Corporation, attempted to get control, but when the Persians, who favor Americans, heard of it, they refused to continue negotiations. Instead, they opened negotiations six months ago with the Sinclair Oil Corporation, and the contract with this firm was in preparation when Imbrie was killed.

"It is folly to say that Imbrie was killed by religious fanatics. A gang of natives was paid to kill off certain Americans interested in the American oil deal. The natives by mistake killed Imbrie."

In a volume called "The World Struggle for Oil," just published in New York as a translation from the French original of Pierre de la Tramerye, the history of the struggle for oil in Persia as well as elsewhere is tersely put. The Anglo-Persian oil company has a thirty-year monopolistic concession, obtained apparently in 1906, for the exploitation of oil in Persia, except for the five northern provinces, which at the time were reserved for Russian influence. It is in these northern provinces, according to present reports, that the Sinclair company (American) has been seeking concessions.

Persia is at present ruled by a premier, Riza Khan —the weak shah, Ahmed, having been deposed and now living in Paris. Riza Khan would like to form a republic, but the monarchical party is conspiring against him. A writer just back from Persia comments:

"Riza Khan favors the American interests. He believes that Persia will be more independent if American, French, and British interests control the oil fields than it would if British interests had all of them. Consequently, the British interests are disposed to stand behind the monarchist movement. It is well known in Persia that not foreign governments but foreign commercial interests are fomenting internal troubles to keep the American interests out of Persia. Only indirectly, therefore, can Major Imbrie's murder be attributed to the warfare in Persia for the control of the oil wells."

This war of commercial interests for oil is no new thing. The intrigues, the dirty work, the desperate measures are as characteristic of American interests as of the British. M. de la Tramerye, in the volume referred to above, states that American oil companies let loose the civil wars in Mexico, to drive out the Pearson interests there. The downfall of Porfirio Diaz is laid by this investigator to his granting the first concessions to the Pearson interests. M. de la Tramerye states:

"Lane Wilson, formerly Ambassador of the United States to Mexico, actually stated in public, on Jan. 7, 1913, that the movement on behalf of Madero had been paid for by the Standard Oil Company, and that a document lying in the archives of the State Department at Washington proved it!"

From all this it may be correctly inferred that this commercial warfare is primarily one of commercial interests, and not of national governments—not at least so consciously. The buccaneering financial policy of some of the great oil companies has been clearly brought out by the recent oil scandals in the United States, in which Secretary Fall played the star part. These cases show that commercial piracy by American companies is as easily directed against American as against foreign national interests. Nevertheless, the tremendous political import of the possession of oil has certainly long been realized by the Government of Great Britain, and later by the French and by the American governments.

The Persian situation is additionally serious because the absolute control of the Anglo-Persian company is in the hands of the British Government, through ownership of two-thirds of the stock, the other third being owned by the Burmah Oil Company, which is directed by the British Admiralty. That Great Britain is closer to British oil policy than is the United States to American oil policy is seen in this and a hundred other ways. Those who are ignorant of all this are the average American and Englishman, Persian and Mexican, who pay the bills and fight the wars that result from the far-reaching intrigues and commercial rivalries.

Herbert Hoover, in a forceful address on Sept. 30, declared for the principle of government supervision but private control of industry. He instances the control of the railroads in the United States, declaring correctly that the system is better than the plan of government ownership rashly urged by Senator La Follette. But the government has no such regulatory supervision over the oil industry, a more mercurial, surging, and potentially explosive, gigantic industry than are the railroads and other public utilities. It should exert such a supervision. It is time to lay the cards on the table, so that ordinary citizens may see them. As between countries there should also be frank dealings and a cessation of sly diplomacy. In our issue of May 21, 1921, we advocated a petroleum treaty, which should take the place of commercial warfare. This remedy is more urgently needed than ever. We quote from our editorial of the above date.

"We hail the dawn of a new era, when fact and science shall be the basis for national laws and international agreements, instead of the past ignorant makeshifts of uninformed politicians and so-called diplomats, and tugs-of-war between interested but stupid parties. Such an era may well be ushered in by honest conferences of the three great friendly countries on the key problem of the allocation of petroleum supplies, not only for themselves, but, with a joint stewardship of the petroleum treasure houses, for the world; and the formation of a petroleum alliance, to which should be admitted guardedly other nations, as the situation justified, and as they signified their desire.

"To quote Cleveland's oft-repeated but immortal phrase, it is a condition which confronts us—not a theory. It is either, from now on, agreement as to a fair rationing of basic world resources among great and ambitious peoples, or that fierce competition whose normal climax is war. With such agreements, the problem of reducing navies and armies becomes no longer a dream, to which we subscribe while voting for enormous increases, but a natural consequence into which we would slip without argument. The vast waste of war and the preparation for war would be applied to betterments, instead of plans for destruction, with all the undreamed-of progress of humanity that would result."

Aluminum and Secrecy

ALUMINUM is a light metal that is protected by a heavy tariff. Also, the aluminum industry is no infant. When to these facts is added the further facts that the Aluminum Company of America dominates the industry in the United States and in turn is dominated by the Mellon interests of Pittsburgh, and that Andrew Mellon is Secretary of the Treasury, one has all the ingredients that are needed for making some Democratic ammunition. Mr. Mellon has now been asked by the Democratic National Committee to join with it in requesting President Coolidge to make public the findings of the Federal Tariff Commission in respect to the adequacy or inadequacy of the duties on aluminum and aluminum products. Mr. Mellon contends, according to the committee, that the tariff has little effect on the price of aluminum. But the committee says that it has heard that the commission has found the duty unnecessarily high, and it wants the finding given to the light. And Mr. Mellon is invited to the party.

It may be that the levying of the present duty on aluminum is just and proper. That can well be left for the joint Tariff Commission to decide. Also, one should hesitate before calling names. The uninformed are likely to brand the Aluminum Company as a trust and damn it accordingly, for the company is a huge, widely ramified organization that does business and has offices throughout the world. The company, however, is not a consolidation of smaller companies that have been gobbled up in the good old-fashioned way. Its organization has been built up by the expansion of its own business and operations and is not the result of the acquisition or combination of independent plants, with one or two exceptions. It undoubtedly does dominate the industry in the United States; and its prices and trade practices are largely what it chooses to make them.

Perhaps the company could spare itself the embarrassment of an inquisition by being less secretive. Why be secretive if there is nothing to conceal! Secretiveness as to metallurgical methods is pardonable, though even there perhaps shortsighted. But when the Aluminum Company refuses to answer even ordinary questions about its business, as it has done in a case within our experience, it certainly looks peculiar. During the last two years, in the course of publishing our long series of articles on the marketing of mineral products, in which almost every mineral and metal that is bought and sold is covered and to which series many important executives have contributed, the Aluminum Company of America is the only interest approached that has refused at its headquarters to give even the slightest information regarding itself. Therefore the question whether it has anything to conceal is quite justifiable.

Iron and Morocco

OUR READERS, and a certain proportion of other intelligentsia, were long ago apprised of the fact that the long-standing quarrel between France and Germany, including the Alsace-Lorraine question, was purely a quarrel over coal and iron mines—a plain fight over the booty. Students who would predict future developments of European history must not forget that these motives will function in the future as well as in the past; and that they will either tend to renew the old quarrel, or—which is not unlikely—may result in an agreement and economic partnership of France and Germany, to which England and the rest will be outsiders, with all that entails.

We are publishing in this issue an acute analysis by Mr. Courtenay De Kalb of another somewhat similar, comparatively unknown, problem, where the future of these and other nations hangs upon the politics of iron mines and the intrigues of iron masters, pulling the strings of their respective governments. He shows the underlying economic drives behind the present war between Spain and the Morocco tribesmen; explaining the cause as the desire of German industry to get control of large iron mines in Morocco. We recommend his analysis to our readers. If it is the case that this war is so stimulated, it is not unnatural. Such intrigues are not so much the natural work of simple politics as they are the work of great commercial interests, bending to great economic stresses and tendencies; and these are naturally transmitted to governmental officials and find a part in governmental policies.

Nor must we believe that such tendencies are peculiarly the property of the German. The considerable part that petroleum interests have played in Mexico's revolutions has never been properly chronicled; the part that gold and diamonds played in the Boer War and the erection of the Dominion of South Africa is an open page.

If one would read history and current events and the future, let him watch the pressure of economic trends, especially such as center around the prime sinews of industry and wealth, like coal, iron, and petroleum; and mayhap he will discern the pulling of the strings by inconspicuous hands, and the consequent alignment of fighting forces, the rise and fall of statesmen, and the fluctuation of national frontiers.

"Pittsburgh Plus" Abolished

ALTHOUGH "PITTSBURGH PLUS" was more or less a dead issue with the steel manufacturers before the Federal Trade Commission made its recent decision regarding this market practice, the steel companies have replied to the commission's order, acquiescing in its demand that the custom be abandoned of quoting steel prices on a Pittsburgh basis plus the freight rate when the products are manufactured and shipped from other points. The steel companies will now make quotations, or sales, on a basis of f.o.b. plant or warehouse, or they will make a delivered quotation, stating how much is charged for the steel f.o.b. plant, and what proportion of the delivered price represents freight. Thus the "Pittsburgh Plus" affair is ended.

A long-drawn-out controversy over the justice of this marketing practice concludes with a clear-cut victory for no one. The Federal Trade Commission has succeeded in bringing the few plants that persisted in a "Pittsburgh Plus" habit to task, but the vast majority of the steel sold in the United States is unaffected. However, the discussions have had an educational value for all students of marketing problems that probably more than balances the cost of the commission's efforts.

Exploring the Earth's Crust

SIR CHARLES PARSONS, in a talk given at a complimentary luncheon tendered him and other visiting foreign engineers by the principal American engineering societies in New York on Sept. 26, dealt upon a plan to put a shaft down into the earth as far as science could drive it, for the purpose of scientific observation. Sir Charles observed that instead of sending so many men to the north pole, the funds of the nation might be utilized in part for such a scientific test-shaft, expenses to be divided among the nations, more or less in proportion to the area of each. He was of the opinion that such a shaft might penetrate to a depth of twelve miles and perhaps more. His estimate was that this exploration in the direction of the center of the world might cost five to ten million pounds sterling.

In an editorial in *E. & M. J.-P.* of May 12, 1923, entitled "Exploring the Earth's Crust," we broached the same idea. The editorial closes as follows:

> "It is rather remarkable, in these days of records, that some mining millionaire has not bequeathed a great sum to the scientific enterprise of sinking a shaft as deep as could be sunk. A sum sufficiently large so that the interest would prosecute the work indefinitely would be ideal. Such a man would leave an appropriate, unique, and abiding monument to his name, and one more original than could be had by founding a library or university.
>
> "We are insatiable explorers. We have explored the earth's surface and the skies for science's sake; but we have not yet explored the inner earth for the sake of science and scientific adventure."

Conditions in Mexico

REPORTS concerning the internal conditions in Mexico are at considerable variance. The general tone is one of optimism. A recent investigating body of Americans returned from a tour with cheerful pictures of conditions as they saw them. Some of our correspondents, however, are not so cheerful, and not at all sure of progress. They state that visitors to the principal cities see things running along with apparent smoothness and calmness, but that in the country it is another story. They say that the lower-class Mexican has imbibed the theory which denies the right of holding property, and that many difficulties ensue as a result. Yucatan, the government of which state is radical, is making a reputation as the champion quick-divorce locality of the world. If that isn't civilization, what is?

All in all, things are probably trending for the better, comparatively speaking. Enthusiasm is hardly warranted under existing circumstances, but slow movements may last long.

The Socialistic Trend

FROM a newspaper report (the *Rocky Mountain News*) we reprint the following concerning the work that has been accomplished by the state-owned testing plant at the Colorado School of Mines at Golden:

> "At the Colorado School of Mines plant tests and reports have been completed on a large number of ores during the last month, most of which were from outside the state. The ores tested and reported on were: Oxidized ore from Idaho, oxidized ore from Washington, silver ore from Montana, silver ore from Washington, gold-silver ore from Mexico, silver ore from Montana, complex ore from Mexico, gold ore from Montana, as well as molybdenum ore from New Mexico.
>
> "Ore tests in progress but not completed included two Mexican cyanide ores, diamond-washing problem from South Africa, tungsten ore from Colorado, and a copper-refinery sludge problem.
>
> "Two mill designs have been contracted for, one from Mexico which awaits completion of experimental work, and the other from Colorado which awaits completion of financing."

Consulting engineers will view these state-subsidized widespread consulting metallurgical activities with surprise and consternation. Business is being done, it appears, not only for Colorado, but for other American states, and even for Mexico and South Africa. The state, in fact, has gone into a private business, handling under the ægis of the government work which has always been done by private engineers, and in which in many cases the state government has no legitimate concern.

Private consulting engineers will see in this a striking socialistic tendency. It is to be compared with the La Follette program of the taking over of all public utilities by the government: a theory which was vigorously exposed by Herbert Hoover in a speech on Sept. 29.

The soundest plan is to frown upon the doing of work by the government which private skill and capital can do; as President Coolidge says, if the people can run the government they can likewise conduct business —direct and not through the instrumentality of the government which they have set up, for political, not business purposes.

Iron Ore and Control of the Strait of Gibraltar

By Courtenay De Kalb
Consulting Mining Engineer

THE CONTROL of the iron resources of Morocco is one of the great politico-industrial goals of the European nations. Linked with this is another problem equally vital. These basic resources of Morocco front the greatest highway of world commerce that exists, for the trade of northern Europe, of the Mediterranean, of the Indies, converges upon Gibraltar.

The world contains three such major focal points of commerce, each of which has constituted a center of diplomatic uneasiness. These are Suez, Panama, and Gibraltar. The question of Suez is settled, in so far as any present dispute between the premier nations is concerned. The question of Panama is adjusted, but not yet quite in positive equilibrium. The Strait of Gibraltar is a bone of contention that makes of it the most menacing political danger spot in the world. Very curiously, the world at large seems unaware of the menace. The Moroccan question threatens the very existence of Spain. If she fail in her efforts to police the northern district, known as the Riff, the entire question of political influence in Morocco will require reconsideration. That will immediately bring France and England into hostile attitudes, with the certainty that Germany, if admitted to international conventions through joining the League of Nations, will demand concessions that will astonish Europe.

The diplomatic stroke at Agadir, when Germany sent gunboats in July, 1911, to that port, was fundamentally because of the outlook for great iron mines in Morocco. It has commonly been affirmed that the Hamburg House of Mannesman, with its profound interests in the country, was responsible for the Kaiser's position toward the question. This is undoubtedly correct, and it was with a forward vision of possibilities in commerce and mining that Germany insisted on becoming a signatory to the Treaty of Algeciras in 1906, supposedly confirming England's promise to France of a free hand in Morocco in exchange for unhampered British control of Egypt, and also providing a buffer nation in control by mandate over northern Morocco, whereby Spain was given special rights of development of natural resources, with the obligation to maintain peace in this region, that is, the Riff. That arrangement kept danger away from the shore opposite to Gibraltar.

Both France and Germany appear to have been well informed as to the probable iron resources of that mountainous district, and they sponsored a regulation of the mineral industry providing for international rights among the signatories for the location of claims, and for the recording of claims with an international commission sitting in Paris. A mining code was then drawn up by Spain, and accepted by the Powers, under which mines in the Riff might be operated. Immediately the House of Mannesman became active, and a great number of locations of mines, largely valuable for their iron, were made throughout the region, and these were recorded long before the Agadir incident.

This episode was followed at once by a notable increase in the strength of the German army, a move that was countered by France passing the three-years military law, which events have been looked upon as directly preparing the way for the World War of 1914.

No sooner had the territory of the Riff been opened for mineral locations than that acute mining operator and great Spanish statesman, the Count of Romanones, with a group of friends, took possession, under the new regulations, of the marvelous mountain of iron called Uixán, about seven miles from the port of Melilla, which has now become one of the mammoth iron mines of the world, operated by the Compañía Minas del Riff. Beyond it, nearer the river Muluya, is a second iron mountain, thought by many to exceed in size and richness the great Monte Uixán. This second iron mountain is known as Kerker, and is controlled by German agents.

Moors Show Hostility

Farther west, back of the old Spanish fortress and port of Alhucemas, is the territory of the Beni-Urriaguel, where the engineers for the House of Mannesman established the existence of a series of enormous iron outcrops, upon which the necessary work preliminary to location was performed. Many of these properties were located, and registered with the international mining commission in Paris. A great many more never progressed that far, since the Moors were hostile to the attempts of outsiders to operate in their territory. Accordingly, they indulged in a variety of savage sport, with the German engineers constituting the "big game." They simply shot them, and took their location papers, duly drawn up ready for registration, and offered them for sale in the towns of Morocco, on the assumption that from these a purchaser could prepare papers of his own for registration.

Undaunted by this apparent hostility, the Germans fixed upon the chief man of the tribe of the Beni Urriaguel, Abd-el-Krim, as their accredited agent, with pay, to carry on propaganda and to be of service to Germany in other ways, during the World War. This chieftain, Abd-el-Krim, was supposed to be a thoroughly "Hispanized" Moor. He and his brother had attended the Central University at Madrid, and Abd-el-Krim had specialized in engineering. The brother inclined toward letters, and has translated "Don Quijote" into Arabic It is clear that they are men of superior mental quality. They were familiar figures in the hotels and cafés of Melilla, the chief Spanish stronghold in the western part of the Riff Coast, the headquarters of the Spanish army in Morocco. Therefore they knew the strength and the weakness of the Spanish forces.

Since the few strongholds of Spain on the Riff Coast had always been protected by advanced positions, time out of mind, to hold back the ever hostile Moorish tribesmen, Spain was accustomed to perpetual border warfare, somewhat similar to the advance of the American frontier against the Indians.

Abd-el-Krim and watchful Germany understood all these things, and knew how unprepared for real war was the army under the valiant General Silvestre. It must be noted, further, that the Riff Coast is indented by a multitude of narrow fjord-like bays, frequently obscured by low-hanging fogs. It is an ideal coast for smuggling, and German agents smuggled to the Moors a large supply of French arms and ammunition captured during the war, but not turned in. The facts regarding this were discovered and made public by the Count of Maugny, Mayor of Draillant, Department of Haute Savoie, some months later, in time to avert dangerously strained relations between Spain and France over the incident.

Accordingly, Abd-el-Krim was prepared for a coup in a manner that his rival, Raisuni, in the eastern portion of the Riff, must have envied. The first blow was struck, aided by treachery on the part of a supposedly friendly village of Moors, at Annual, in July, 1921. So well equipped were the Moors, so complete was the surprise, that the victorious Abd-el-Krim almost reached the plaza of Melilla. Since then the front has been pushed back again beyond the valley of the Kert, and the west remains in the hands of the Spaniards, although a recent raid momentarily cut communications between Tetuán and Tangier. This raid, though of small consequence in itself, served as a peg on which France could hang a protest against Spain's failure properly to police the zone over which she had been given a mandate. Necessarily, England technically agreed with France, and notes were sent to Madrid. It is evident from this that England does not, as she manifestly could not, intend to allow any other power to act alone in questioning Spain regarding a matter that might suggest the use of force in the vicinity of Ceuta.

Harmonious action between England and France seems likely because both are fully aware of the desire of Germany, which has now become an open secret, to insist upon applying the policy of "self-determination," affirmed in the Treaty of Versailles, to the territory still dominated by the rebellious Abd-el-Krim, and to recognize the so-called republic that he has organized. If this were accomplished, Abd-el-Krim, the paid agent of Germany, would naturally confirm the Germans in their claims to the right of ownership of the mines in the lands of the Beni-Urriaguel, and give them perhaps something even more substantial than the shadow of political power through their influence in such a Moorish state lying almost within the Gates of Hercules that England so jealously guards at the Rock of Gibraltar.

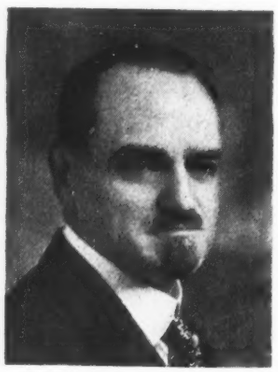
The Premier Mine, British Columbia, from the Big Missouri Trail

Camp of the Premier gold and silver mine, the famous bonanza near Stewart, B. C. 1, Premier mill; 2, 3, 4 and 5 are portals of No. 1, No. 2, No. 4 and No. 6 tunnels respectively; 6 and 7 are portals of No. 2 and No. 3 tunnels of B. C. Silver Mines, Ltd., a near-by prospect

Design of Large Suspension Bins

Two Types and the Results That They Gave in Operation

By H. Kenyon Burch
Consulting Engineer, Junior Orpheum Bldg., Los Angeles



H. Kenyon Burch

THE recent completion of the 5,000-ton concentrator for the New Cornelia Copper Co., at Ajo, Ariz., afforded an opportunity of comparing two radically different designs of suspension bin, and the behavior of each under operating conditions. Theoretically, the suspension bin can be constructed economically, utilizing as it does the high tensile strength of steel to full advantage. It is probable that the adoption of this type of bin for comparatively small cross-sections is practicable; but my experience with the two bins to be described has not been an entirely satisfactory one, although each has been fairly efficient.

Bin 330 Feet Long

The first bin of this type built under my supervision was completed in 1915 at the plant of the Inspiration Consolidated Copper Co., Miami, Ariz., and is shown in cross-section in Fig. 1. It is supported between two rows of columns 35 ft. apart and spaced 16 ft. 8 in. centers, longitudinally. It has a total length of 330 ft., and an approximate cross-section area of 800 sq.ft., or an estimated capacity of 40 tons per linear foot of length.

The top of the bin plate is reinforced to act as a girder to distribute the load between the columns; and the horizontal thrust, due to the tension in the bin plates, is taken up by the floor beams supporting the track stringers of the two standard-gage tracks indicated.

The ore is brought to the bin by means of 60-ton, bottom-dump ore cars, after being crushed to about 1½-in., maximum size. Discharge gates are provided in the center of each 16-ft. 8-in. bay, the ore being fed from the gates by means of pan feeders, supported on a structure built independently of the bin and feeding directly to belt conveyors. The curve to which the bin was built was established in accordance with the standards adopted by the steel fabricator in consultation with Samuel Berquist, the originator and inventor of the suspension type of bin.

Effect of Loading

When the bin was loaded it assumed a shape indicated by the dotted line: the bottom dropped at the center and the sides drew inward at the point of support. The vertical side plates, which were riveted to the inner face of the columns, were somewhat distorted at their intersection with the column face, and it was necessary to cut loose several rivets at each column, at *D* and *D'*, to relieve the flanges of the column of this distortion. These rivets were replaced immediately, using a wedge-shaped filler between the face of the columns and the bin plate. The lowering of the bin bottom at *C* dropped the discharge hopper onto the pan feeder, necessitating the cutting off of the bottom edge of the hoppers to provide the necessary clearance.

The New Cornelia bin is shown in Fig. 2; it has a cross-section area of about 665 sq.ft. and a total length of 300 ft. It was designed in accordance with the formula proposed by Ketchum, with adequate allowance for surcharge. It has a capacity of about 33 tons

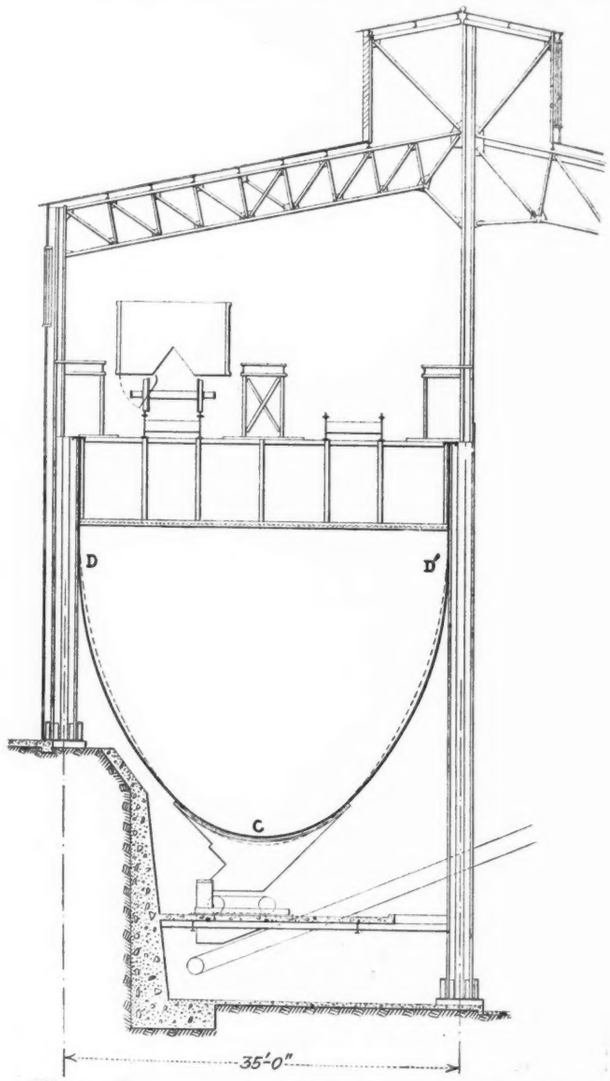


Fig. 1—The suspension bin at the Inspiration plant

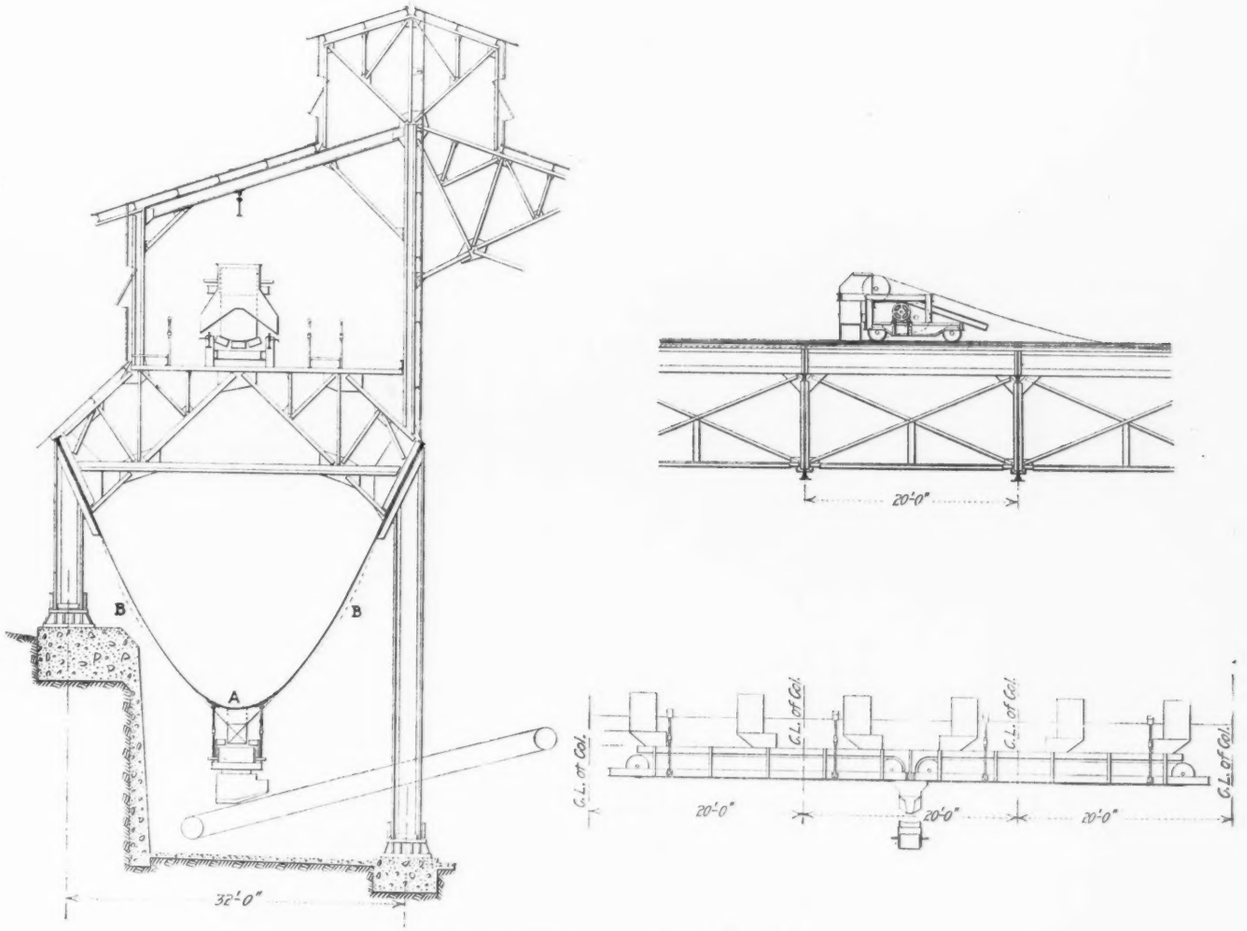


Fig. 2—The suspension bin at Ajo

per linear foot, and the main supporting columns are 32 ft. apart and spaced at 20-ft. centers, longitudinally. The top edge of the side plates is reinforced as a girder flange, and the horizontal thrust is taken up by the bottom chord of the truss that supports the tripper track. The bin is loaded by means of an automatic reversing tripper on a 42-in. belt conveyor from the fine-crushing plant, where the ore is crushed to about ½-in., maximum. Hoppers are spaced 10 ft. apart, and each group of three discharges onto an armored belt feeder delivering the ore to the center of each 60-ft. unit.

Detail of Design

In view of previous experience at Inspiration it was thought advisable to suspend the discharge feeders from the bottom of the bin; and, accordingly, the framework on which each of these feeders operates is supported by four hanger rods from the bottom of the bin. Each rod is provided with a turnbuckle, for adjustment; and ample space is provided between the feeder frame and the hopper into which the feeders discharge, in order to take care of the anticipated vertical movement of the feeders in consequence of the distortion of the bin plate. When the bin was loaded it assumed the shape shown by the dotted line *B A B*, having moved upward at the bottom about 2 in. The discharge hoppers, of welded steel plates, were badly distorted, and in some cases the welded corners were ruptured for some distance and to an extent that made it necessary to make changes to relieve the condition that had been brought about by the distortion of the bin plates.

Self-discharging Arrangement

The discharge hoppers were built as shown, with the idea of making the bins as nearly self-discharging as possible, bearing in mind the considerable dead space left longitudinally between the hoppers. Various expedients have been proposed to accommodate these to the distortion of the bin plates and to minimize the distortion effect. Making them narrower across the bin, as shown by the dotted lines, would help, although the self-discharging feature is sacrificed. A flexible support, with provision for sealing against leakage the connection between bin and hopper, has possibilities. Putting the hoppers under an initial distortion, and opposed to that of the bin, is the plan adopted for the New Cornelia bin, which is, apparently, satisfactory. It is probable that other methods will be developed if the importance of the problem can be fully appreciated and more time devoted to its solution.

Anticipating Working Conditions

It has been a well-established policy with me and my staff to anticipate as fully as possible the conditions to be met in the various structures and equipment in a plant, and to specify completely the loads, duties, and results to be expected of any unit. Carrying the

idea a step further: Specifications and instructions to bidders for structural steel work make particular mention that the contractor must assume full responsibility for the correct design and construction of the various structures covered by his contract. This is done in order to impress him with the necessity of a careful investigation of the strength and performance of members as outlined, so that the buyer shall have the fullest possible benefit of the contractor's technical and practical experience. This rule applies even though the size and shape of members are fully covered in the drawings submitted for bids. Accordingly, it was felt that the suspension bins as built at the two plants under discussion represented the best products of engineering experience, as exemplified by the fabricator and my own staff.

It is evident, however, from a comparison of the two bin profiles, that neither exactly fulfills the desired condition, and that the two curves have a tendency to approximate the same general form when the bins are loaded. It would appear that further data are necessary to arrive at the true form of the curve and to insure the designing of discharge hoppers that would not be seriously affected by the distortion of the bin.

Load Subject to Constant Variation

Under operating conditions the load in the bins is constantly varying, the material being delivered at irregular intervals and withdrawn at an approximately constant rate. In a bin of the length indicated it is also probable that some of the units of the mill may be down for repairs or adjustments, while others are operating, resulting in an unbalanced condition in the bin as between adjacent sections. Unsymmetrical loading may also develop if the ore is inclined to "chimney," whereby only a small portion immediately above the discharge gate is drawn out, leaving the remainder standing almost vertical and to the full depth of the bin. Under such changing conditions there is certain to be a considerable variation in the curve of either of the two bins illustrated; and it is doubtful if any curve can be developed that would avoid this continual distortion and consequent stressing of the bin plates as a result of the bending at the points of support. It is probable that other types of bin, although admittedly less economical as to construction, would offer advantages that would more than compensate for the additional construction expense.

J. E. Lanning, who was structural engineer on the construction of the Inspiration plant and, later, chief engineer of my staff, has had direct charge of the design of both bins and has assisted me in the preparation of these notes.

What Happens When Dynamite Explodes?

By Charles S. Hurter

Big dynamite blasts are more and more frequent items of news. Charges of dynamite are buried deep in the face of a cliff, an electric switch is turned, there is a deafening roar, and thousands of tons of rock come crashing down. What, the inquiring observer asks, produces this explosion? What actually happens when dynamite explodes?

To answer this question it is necessary to explain briefly what dynamite is. Reduced to its essentials, dynamite is a mixture of nitroglycerin with wood meal and nitrate of soda or nitrate of ammonia, or both. Nitroglycerin, in turn, is composed of several different elements—namely, carbon, hydrogen, nitrogen, and oxygen, the molecules of which are grouped in such a way as to form a heavy, oily, yellow liquid. Now, these same molecules are capable of arrangement in other groups to form several different substances instead of the one, and the bonds which hold them together in the particular arrangement which makes nitroglycerin are very weak.

Consequently, when the electric current sets off the detonator imbedded in the dynamite and this imparts a sharp shock and very high temperature to the nitroglycerin, the bonds between the molecules which compose the nitroglycerin break down. The nitrogen and some of the oxygen remain free—both of them gases—while the other molecules instantly combine to form two compound gases, namely carbon dioxide and water vapor.

The breaking down of the nitroglycerin and rearrangement of its molecules generates a great deal of heat—enough to raise the temperature of the gases to 6,300 deg. F. or thereabouts—and this high temperature causes the other ingredients of the dynamite to decompose into gases, or to burn, with the release of still more heat.

All of these changes take place in a single instant, and the highly heated and rapidly expanding gases, which would normally occupy a much greater volume than the dynamite, exert a sudden tremendous pressure on the walls of the bore hole. The rock gives way and the rapidly escaping gases set the air into violent vibration.

To the beholder, the explosion consists of the roaring noise and the rending of the rock, but in reality these are only the audible and visible results of the rearrangement of the molecules of the dynamite when subjected to a shock from the detonator, this conversion of the nitroglycerin and other ingredients of the dynamite into instantly released gases constituting the actual explosion.

Corrections

A. P. Sviridoff states that the following corrections should be made in his article "Methods of Gold Mining in Eastern Siberia," which appeared in the issue of *Engineering and Mining Journal-Press* published on Aug. 16, 1924.

On p. 253, the table should read "8.61 dolias in 3.6607 gr." under "Gold Won by Drilling." On p. 255, the third line from the top of the first column should read so as to omit the words "per hour." The sixth and seventh lines following should read "44 rubles, or 1.74 rubles per cu.yd." On p. 257, the first line of the paragraph under the heading "Expenses of Operation" should read, "The average summer expenses for one hour." On p. 258, the fifth column of the first table should read "1.85 rubles" and not "1.82 rubles." The seventh column in the same table should read "$0.34 per cu.yd." and not "$0.034 per cu.yd."

All who are interested in keeping a file record of data on the subject covered would do well to correct the pages in accordance with the author's foregoing suggestions.

Continuous Vacuum Filters in Cyaniding

Success of Filtration of Decantation Tailings at Hollinger Inspires Further Work—Series Filtration Now Used at Argonaut—Several Flow Sheets Suggested

By B. D. Kelly
Metallurgical Engineer, Timmins, Ont.

B. D. Kelly

TWELVE years have elapsed since the first ore-treatment plants were put into operation in the Porcupine district of northern Ontario. The first plants built in the district, which milled in cyanide solution, used filters of one form or another for separating the pregnant solution from the solids after agitation. The Vipond Mines, Ltd., and the Porcupine Crown Mines, Ltd., were the first to adopt decantation. These plants were small, having a capacity of 100 and 125 tons per day respectively. The flow sheet was as generally shown in flow sheet No. 1 shown herewith. The ore treated by the Porcupine Crown was ideal for this process, being mostly quartz, and when ground to approximately 75 per cent minus 200 mesh the resulting pulp was granular and had a high settling rate. For this reason it was possible to keep the moisture in the discharge from each thickener at 40 per cent and 35 per cent was quite common. Both the mechanical and metallurgical results from these decantation plants were excellent, and largely influenced other operators to adopt the decantation process for treating their ores, all of which were of similar character.

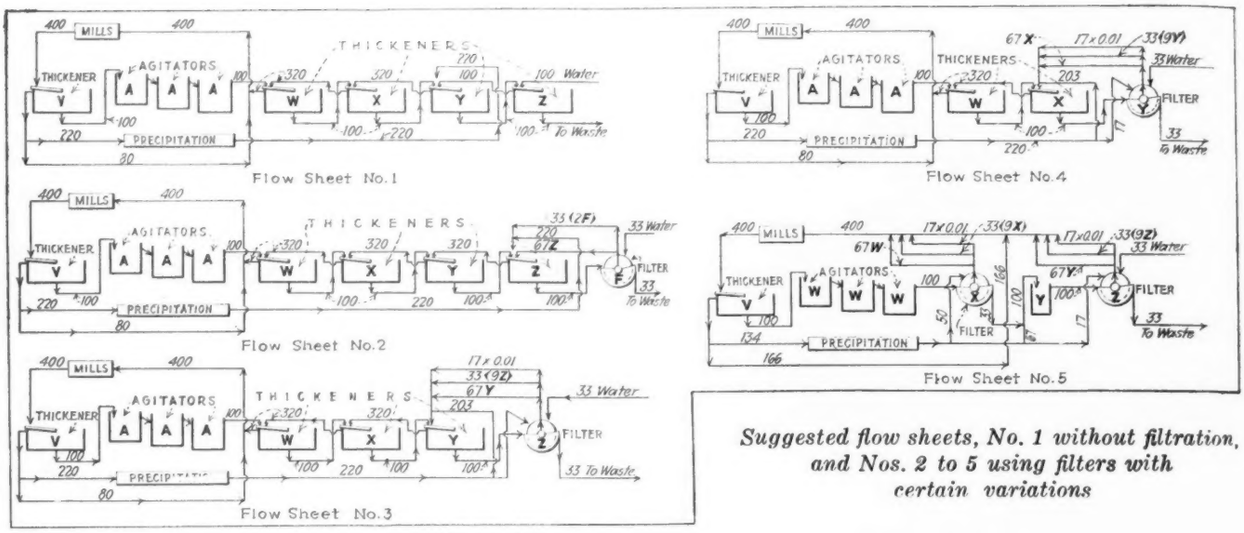
Every plant built in the Porcupine and Kirkland Lake districts from 1914 to 1922 inclusive used decantation in some form, with widely varying results. Those mines fortunate enough to have an ore that had a high settling rate got fair results in the summer, when the temperature of the mill solutions was high, but in the winter the temperature of the mill solutions dropped and the slime settlement slowed down proportionally. Operators then had either to reduce their tonnage or be prepared to take a high dissolved gold loss. The mines with ore that produced a slow settling slime were out of luck all the time. The usual decantation flow employed was as generally shown in flow sheet No. 1. In a few plants, the pulp was agitated at 4:1, from the grinding mills, but this required such a large volume of agitator capacity to give the required time of treatment that this method has been discarded for the flow sheet shown.

It will be seen from the figures covering flow sheet No. 1 that, under the assumed conditions, the dissolved gold loss would be theoretically $0.09788 per ton of ore treated. The method employed for arriving at this figure is that shown in the Dorr Company's catalogue describing the decantation process. This method of figuring is on the assumption that the washing and diluting in each stage of decantation is perfect. In practice this is not the case. Gold is carried toward the tailings end of the plant owing to imperfect washing and to absorption and adsorption. The amount lost from the last named causes will vary considerably with different ores and will be determined by the percentage of slime produced which approaches a colloidal condition. Under the conditions assumed, which may be taken as average, the actual dissolved gold loss will be approximately 7c. in excess of the theoretical. To use even numbers, consider the theoretical loss as 10c. On this basis the actual dissolved gold loss would be 17c. per ton of ore milled. Also, under average conditions of operation, the solution discharging from the final wash tank would contain 0.4 lb. potassium cyanide per ton. At 16c. per lb. in the mill, this represents $0.064 per ton of solution. At a dilution ratio of one ton of solution to one ton of ore this represents a mechanical loss of cyanide amounting to $0.064 per ton of ore milled, or a combined gold and cyanide loss amounting to $0.234 per ton. By increasing the precipitation ratio the dissolved gold losses can be reduced materially, but the clarification and precipitation costs are increased and the capacity of a given size of thickener is decreased.

Hollinger Results Have Been Good

During 1921, the Hollinger engineers purchased a 14x16-ft. Oliver filter for experimental purposes, the object being to determine whether or not a saving could be made by filtering the pulp as discharged from the decantation plant. Early in 1922 this experimental filter had been in operation for approximately six months. The results were sufficiently attractive to warrant the installation of six additional Oliver filters to handle the tailings from the entire decantation plant.

In July, 1923, this filter plant was handling 0.78 tons of dry solids per square foot of filter area on a filter feed containing approximately one ton of solution to one ton of solids, and discharging the cake at 21 per cent moisture. The cake was spray-washed with water. the latter being equivalent in volume to the amount of solution discharged with the cake to waste; 79 per cent of the solution in the feed was recovered while the cake was being formed. Of the 21 per cent remaining in the cake, 75 per cent was displaced and recovered by the spray-washing, making a total recovery by the filter of approximately 93.75 per cent of the pregnant solution in the filter feed. When using a water wash only, the mechanical saving in cyanide would be the same.



Suggested flow sheets, No. 1 without filtration, and Nos. 2 to 5 using filters with certain variations

The cake is collected from the seven filters, set in a row, by means of a 24-in. belt conveyor, which discharges into a pug mill consisting of a series of four open impellers mounted on a horizontal shaft set in a suitable cast-iron box. The impellers are revolved at a suitable speed to break up the cake. An 8-in. Morris sand pump is set as close as possible to the pug mill. Sufficient water is added to the pug mill to dilute the cake to one ton of water to one ton of solids. The partially re-pulped cake flows into the suction of the 8-in. pump which elevates it 40 ft. above the pump. The slime as discharged from the pump line is thoroughly re-pulped and flows down the tailing launder to waste. Both the pug mill and Morris pumps are belt driven and are installed in duplicate, thereby providing a stand-by unit.

The entire operating cost for filtering, conveying, mixing, and pumping was 4½c. per ton on a daily capacity of approximately 3,800 tons. If 1c. per ton is allowed for amortization, which is a conservative figure, the total cost becomes 5.5c. per ton of solids filtered.

This operation marks a turning point in cyaniding practice in this district.

In October, 1921, I completed a test with an experimental American filter in one of the mills of the Porcupine district. The filter used was a 4-1 American having one disk 4 ft. in diameter, and with approximately 22 sq.ft. of filter area. The filter was tried on pulps of varying densities and values. Daily capacities ranged from 0.486 tons per square foot on a feed containing 18.7 per cent solids to 1.064 tons per square foot on feed containing 53.3 per cent solids. By using a highly atomized spray wash on the cake, a displacement efficiency of 87 per cent was obtained, and the moisture in the cake discharged from the filter varied from 19.2 to 23.1 per cent, depending upon the thickness of the cake.

Reasons for Continuous Series Filtration

From the results of these tests, and also from the data obtained on a large scale from the Oliver filter plant at the Hollinger, I came to the conclusion that, when judged from all angles, continuous vacuum filters operating in series were the most efficient devices for separating the pregnant solution from the solids after agitation. My reasons for coming to this conclusion may be enumerated as follows:

Conditions Assumed

One hundred tons of ore per day crushed in cyanide solution.

Discharge from all thickeners with 50 per cent moisture.

Ten dollar values dissolved per ton of ore—70 per cent in mills and 30 per cent in agitators.

Agitation with a dilution of 1 of solution to 1 of solids.

Discharge from filters at 25 per cent moisture.

Precipitate solution to $0.01 by Merrill and Crowe processes.

Figures refer to solution tonnages only.

1. Small building space per unit of capacity.
2. Low capital expenditure per unit of capacity.
3. Low clarification and precipitation ratio.
4. Low dissolved gold loss.
5. Low mechanical loss of cyanide.
6. Low chemical consumption of cyanide due to the small volume of solutions in circuit.
7. Flexibility, due to the large excess of solution overflowing the primary thickener, which permits of a wide variation in the precipitation ratio.
8. Low refining cost, due to the comparatively small volume of precipitates to be smelted.

Counter-Current Decantation Has Advantage of Simplicity

On the other hand, continuous counter-current decantation has the following advantages over series filtration:

1. Comparative simplicity of operation.
2. Simplicity of design.
3. Slightly lower cost of operation.

In the early part of 1922 I was engaged to design a mill of 100 tons' daily capacity for Argonaut Gold, Ltd. The process adopted for separating the pregnant solution from the solids was series filtration. In July, 1923, the mill was started. This mill is now treating an average of 110 tons of ore per day, and the dissolved gold losses are practically nil.

Two 6-4 American filters are used. Pulp at approximately 1:1 is fed to the first filter. The cake is spray-washed with barren solution and discharged from the first filter at approximately 22 per cent moisture into a 10x10-ft. Dorr agitator. Sufficient barren solution is mixed with the cake to dilute the pulp back to 1:1. The Dorr agitator on this small tonnage re-pulps the

cake perfectly. The re-pulped cake is then fed to the second filter, where it is filtered again and washed with water; the cake at approximately 22 per cent moisture is then sent to waste.

Suggested Flow Sheets for 500-Ton Mill

Early in 1923 I was engaged to design a mill of 500 tons' daily capacity for one of the Porcupine mines in the development stage. To determine the most economical and efficient flow sheet for this particular job, three complete sets of general drawings were made, and estimates of cost on each were prepared. The proposed flow sheets were as generally shown by flow sheets 1, 3, and 5 accompanying this article. As we are here concerned only with the problem of separating the pregnant solution from the solids after agitation, I have assumed in the following five flow sheets that the grinding, primary thickening, and agitating of the pulp is the same in all cases, and I therefore estimated the capital expenditure and cost of operation for each flow sheet from the point where the pulp leaves the agitators.

Flow Sheet No. 1

Let V, W, X, Y, and Z represent the contained values in dollars per ton of solution discharged from the respective thickeners.

Equating out of and into each thickener.

(1) $100\ V + 300\ V = 320\ W + 80\ V + (0.70 \times \$10.00 \times 100)$
(2) $100\ W + 320\ W = 320\ X + 100\ V + (0.30 \times \$10.00 \times 100)$
(3) $100\ X + 320\ X = 100\ W + 320\ Y$
(4) $100\ Y + 320\ Y = 100\ X + 100\ Z + (220 \times 0.01)$
(5) $100\ Z + 100\ Z = 100\ Y + 100\ H_2O$ @ \$0.00.

Simplifying	Solving
(1) $V = W + 2.1875$	(1) $V = \$4.51094$
(2) $W = X + 1.62109$	(2) $W = 2.32344$
(3) $X = Y + 0.50659$	(3) $X = 0.70235$
(4) $Y = 0.3125\ Z + 0.16518$	(4) $Y = 0.19576$
(5) $2\ Z = Y$	(5) $Z = 0.09788$

To check these figures:

The amount precipitated from 220 tons @ (\$4.51094—0.01)	\$990.2068
Loss in tailing, 100 tons @ \$0.09788	9.788
	999.9948
Amount due to neglected decimals	0.0052
Amount dissolved from 100 tons @ \$10.00	\$1,000.0000

Flow Sheet No. 2

Conditions the same as in No. 1, except filter on the end. The displacement efficiency of the filter is 66⅔ per cent—that is, 66⅔ per cent of the values in the solution in the cake, which is assumed to contain 25 per cent moisture or 33 tons of solution per 100 tons of solids, are recovered. The amount, 67 Z, returned from the filter to the last thickener, represents 67 tons of solution removed from the pulp in loading the filter, which will still have the same assay as Z.

Let V, W, X, Y, and Z represent the contained values in dollars per ton in the solution discharged from thickeners and filter respectively.

(1) $100\ V + 300\ V = 320\ W + 80\ V + (0.70 \times \$10.00 \times 100)$
(2) $100\ W + 320\ W = 320\ X + 100\ V + (0.30 \times \$10.00 \times 100)$
(3) $100\ X + 320\ X = 100\ W + 320\ Y$
(4) $100\ Y + 320\ Y = 100\ X + 320\ Z$
(5) $100\ Z + 320\ Z = 100\ Y + 67\ Z + 33\ (2F) + (220 \times 0.01)$
(6) $33\ F + 67\ Z + 33\ (2F) = 100\ Z + 33$ tons water of no value.

Simplifying	Solving
(1) $V = W + 2.1875$	(1) $V = \$4.55154$
(2) $W = X + 1.62109$	(2) $W = 2.36404$
(3) $X = Y + 0.50659$	(3) $X = 0.74295$
(4) $Y = Z + 0.15831$	(4) $Y = 0.23636$
(5) $3.833\ Z = F + 0.2732$	(5) $Z = 0.07805$
(6) $F = 0.333\ Z$	(6) $F = 0.02599$

To check these figures:

The amount precipitated from 220 tons solution @ \$4.55154—0.01)	\$999.1388
The amount lost in tailing, 33 tons @ \$0.02599	0.85767
	\$999.99647
The amount due to neglected decimals	0.00353
The amount dissolved from 100 tons @ \$10.00	\$1,000.00000

Flow Sheet No. 3

The displacement efficiency of the filter is 90 per cent—that is, 90 per cent of the contained values in the solution in the cake, which is assumed to contain 25 per cent moisture or 33 tons of solution per 100 tons of dry solids, are recovered. The amount, 67 Y, returned from the filter to the last thickener will have the same assay as Y.

Let V, W, X, Y, and Z represent the contained values in dollars per ton in the solution discharged from thickeners and filter respectively.

Equating out of and into each thickener or filter:

(1) $100\ V + 300\ V = 320\ W + 80\ V + (0.70 \times \$10.00 \times 100)$
(2) $100\ W + 320\ W = 320\ X + 100\ V + (0.30 \times \$10.00 \times 100)$
(3) $100\ X + 320\ X = 320\ Y + 100\ W$
(4) $100\ Y + 320\ Y = 67\ Y + 33\ (9Z) + (203 + 0.01) + 100\ X + (17 \times 0.01)$
(5) $33\ Z + 67\ Y + 33\ (9Z) + (17 \times 0.01) = 100\ Y + (17 \times 0.01) + 33$ water.

Simplifying	Solving
(1) $V = W + 2.1875$	(1) $V = \$4.55186$
(2) $W = X + 1.62109$	(2) $W = 2.36436$
(3) $X = Y + 0.50659$	(3) $X = 0.74327$
(4) $Y = 1.1739\ Z + 0.2089$	(4) $Y = 0.23668$
(5) $Z = 0.10\ Y$	(5) $Z = 0.02366$

To check these figures:

The amount precipitated from 220 tons solution @ \$4.55186—0.01	\$999.2092
The amount lost in tailing, 33 tons solution @ \$0.02366	0.7808
	\$999.9900
The amount due to neglected decimals	0.0100
The amount dissolved from 100 tons @ \$10.00	\$1,000.0000

Flow Sheet No. 4

The displacement efficiency of the filter is 90 per cent—that is, 90 per cent of the values in the solution in the cake, which is assumed to contain 25 per cent moisture or 33 tons of solution per 100 tons of dry solids, are recovered. The amount, 67 X, returned from the last thickener from the filter, will have the same assay as X.

Let V, W, X, and Y represent the values in dollars per ton in the solution discharged from each thickener or filter respectively.

Equating out of and into each thickener and filter:

(1) $100\ V + 300\ V = 320\ W + 80\ V + (0.70 \times \$10.00 \times 100)$
(2) $100\ W + 320\ W = 320\ X + 100\ V + (0.30 \times \$10.00 \times 100)$
(3) $100\ X + 320\ X = 33(9\ Y) + 67\ X + (17 \times 0.01) + (203 \times 0.01) + 100\ W$
(4) $33\ Y + 67\ X + 33\ (9\ Y) + (17 \times 0.01) = 100\ X + (17 \times 0.01) + 33$ water of no value.

Simplifying	Solving
(1) $V = W + 2.1875$	(1) $V = \$4.5444$
(2) $W = X + 1.62109$	(2) $W = 2.3569$
(3) $X = 1.1739\ Y + 0.64944$	(3) $X = 0.73581$
(4) $Y = 0.10\ X$	(4) $Z = 0.07358$

To check these figures:

The amount precipitated from 220 tons solution @ \$4.5444—0.01	\$997.568
The amount lost in tailing, 33 tons solution @ \$0.07358	2.428
The amount due to neglected decimals	0.004
The amount dissolved from 100 tons @ \$10.00	\$1,000.000

Flow Sheet No. 5

The displacement efficiency of each filter is 90 per cent—that is, 90 per cent of the solution in the cake, which is assumed to contain 25 per cent moisture or 33 tons of solution per 100 tons of dry solids, is recovered. The amounts 67 W and 67 Y returned to the grinding mills will have the same assay as W and Y respectively.

Let V, W, X, Y, and Z represent the contained values in dollars per ton in the solution discharged from each tank or filter respectively.

Equating out of and into each tank and filter:

(1) $100\ V + 300\ V = 67\ W + 33\ (9X) + (17 \times 0.01) + 166\ V + 67\ Y + 33\ (9\ Y) + (17 \times 0.01) + (0.70 \times \$10.00 \times 100)$
(2) $100\ W = 100\ V + (0.30 \times \$10.00 \times 100)$
(3) $33\ X + 67\ W + 33\ (9\ X) + (17 \times 0.01) = 100\ V + (0.30 \times \$10.00 \times 100) + (50 \times 0.01)$
(4) $100\ Y = 33\ X + (67 \times 0.01)$
(5) $33\ Z + 67\ Y + 33\ (9\ Z) + (17 \times 0.01) = 100\ Y + (17 \times 0.01) + 33$ water.

Simplifying	Solving
(1) $V = 1.9108\ X + 1.778\ Z + 5.3999$	(1) $V = \$7.4639$
(2) $W = V + 3$	(2) $W = 10.4639$
(3) $X = 0.10\ V + 0.301$	(3) $X = 1.04739$
(4) $Y = 0.33\ X + 0.0067$ or $0.033\ V + 0.10603$	(4) $Y = 0.3523$
(5) $Z = 0.10\ Y$ or $0.0033\ V + 0.010603$	(5) $Z = 0.03523$

To check these figures:

The amount precipitated from 134 tons solution @ \$7.4639—0.01	\$998.8226
The amount lost in tailing, 33 tons solution @ \$0.03523	1.1626
	\$999.9852
The amount due to neglected decimals	0.0148
The amount dissolved from 100 tons @ \$10.00	\$1,000.0000

Below is given the cost of that part of each plant under discussion—namely, from the point where the pulp leaves the agitators to the point where it is discharged to waste, including the cost of clarification and precipitation equipment; pumps; motors; 45-ft. two-compartment Dorr tray thickeners set on elevated reinforced concrete bases; concrete foundations; steel frame building, with double sheathing on all outside walls; insulating felt; 2-in. T. & G. plank roofing; Johns-Manville 4-ply asphalt roofing; galvanized iron sheathing; glazing; painting; heating system; sprinkler system; concrete floors throughout; all tanks of steel and thickener superstructures of steel; all the necessary auxiliary equipment such as piping, transmission, and the like, for a complete unit in each instance capable of treating 500 tons of dry solids per twenty-four hours. All prices of material and equipment are as quoted in August, 1923, and estimates are based on erection of the plant 2½ miles from the railway.

To make this article more complete I also estimated the cost of plants under the same conditions but employing flow sheets Nos. 2 and 4. No. 2 is adaptable to plants having four-step decantation in service, and No. 4 to plants having four-step decantation in service and desiring to double capacity at a minimum of cost.

The following estimates cover the cost of plants under the conditions assumed above:

Flow sheet No. 1	$185,415
Flow sheet No. 2	218,116
Flow sheet No. 3	186,370
Flow sheet No. 4	152,589
Flow sheet No. 5	103,172

The above estimates are based on the installation of American filters. In the event that drum-type filters are used the capital expenditure on the filter plant will be larger, owing to the fact that the building contents required per unit of capacity will be considerably greater.

What the Flow Sheets Represent

Flow sheet No. 1 shows a five-tank decantation process.

Flow sheet No. 2 shows a five-tank decantation process followed by a continuous vacuum filter. Although I have shown above that it is possible to get a 75 per cent displacement wash with this type of filter when only the equivalent in water wash is used to the amount of solution discharged with the cake, it must be borne in mind that this will vary considerably with different ores. For this reason I have assumed a displacement efficiency of only 66⅔ per cent in this instance.

Flow sheet No. 3 shows a four-tank decantation process followed by a filter. The displacement efficiency is assumed to be 90 per cent, this increased efficiency being obtained by preceding the water wash with a barren-solution wash. Since the amount of water which may be introduced into the mill circuit is limited to the amount of solution discharged to waste with the cake from the filter, and since in most cases the cake is capable of absorbing more wash, it is obvious that to get the maximum displacement efficiency, barren solution should be sprayed on ahead of the water wash up to the limit of all the cake will absorb.

Flow sheet No. 4 is shown to illustrate a means of easily doubling the capacity of a five-tank decantation plant. It is only necessary to install one additional primary thickener, the required volume of agitator capacity, and then split up the one series of four wash tanks into two series of two tanks each, followed by the required filter capacity.

Flow sheet No. 5 shows continuous vacuum filters operating in series—that is, the feed to the first filter, at a ratio of one ton of solution to one ton of solids, is taken direct from the agitators. Under the assumed conditions, of the 100 tons of solution in the original pulp, 67 tons are recovered during the formation of the cake, leaving 33 tons in the cake. This cake is then spray-washed with barren solution (approximately 50 tons), which displaces 90 per cent of the solution remaining in the cake. After washing, the cake is discharged from the first filter at 25 per cent moisture, or containing 33 tons of solution having a value of approximately one-tenth the value of the solution in the filter feed. This cake is re-pulped with the addition of 67 tons of barren solution, containing approximately 1c. per ton, thereby diluting the pulp back to a ratio of approximately 1 : 1. A suitable means must be provided for thoroughly re-pulping the cake at this point. The pulp is then filtered on the second filter and a combined barren solution and water wash used to obtain the maximum displacement efficiency. The cake is then discharged to waste.

I do not claim that flow sheet No. 5 is a "cure-all" for all cyaniding ills, but I think that there will be a number of plants in the Porcupine district employing this process within the next few years.

From the standpoint of the recovery of the dissolved values (both gold and cyanide), flow sheet No. 3 is probably as efficient as flow sheet No. 5. However, the capital expenditure on the former, on the basis of 500 tons per day, is $83,198 greater, and the precipitation ratio is 2.2 to 1 against 1.34 to 1. Furthermore, the excess solution overflowing thickener *V* in No. 3 is 0.8 to 1, whereas in No. 5 it is 1.66 to 1. This makes No. 5 much more flexible and offers greater protection against high losses resulting at times when the values in the mill feed are suddenly increased. Having this large excess of solution overflowing thickener *V*, the precipitation ratio can be widely varied in accordance with the values in the mill feed.

An estimate of the operating costs per ton on a plant similar to flow sheet No. 1, based on the published costs of operating companies, follows:

Thickening (four steps)	$0.04
Clarifying and precipitating on basis of 2.2 tons solution per ton ore @ 5c. per ton	0.11
Total	$0.15

An estimate of the operating costs per ton on a plant employing flow sheet No. 5 on the same basis follows:

Filtering in series @ 5½c. each filtration	$0.11
Clarifying and precipitating on basis of 1.34 tons solution per ton ore @ 5c. per ton	0.067
Total	$0.177

The difference in operating cost in favor of No. 1 is $0.027 per ton.

As previously stated, the combined value of gold and cyanide discharged to waste in No. 1 would be $0.234 per ton of ore milled. The values in *Z* in the calculations covering flow sheet No. 5 are $0.03523 per ton of solution. As only 0.333 tons of solution are discharged per ton of ore milled, the dissolved gold loss per ton of ore would be $0.0117. Let me assume this as being $0.02 per ton of ore. Also, assuming the mechanical loss of cyanide at 0.1 lb. potassium cyanide per ton of ore milled,

the cyanide loss, based on cyanide at 16c. per lb., becomes $0.016 per ton of solids. Therefore the combined gold and cyanide loss, when employing flow sheet No. 5, would be $0.036 per ton of ore milled. On this basis the difference in losses between the two methods would be $0.198 per ton of solids in favor of No. 5. Deducting the difference in operating cost of $0.027, the net gain by employing series filtration over five-tank decantation would be $0.171 per ton of ore milled.

On the same basis of costs, per ton of ore:

Flow Sheet No. 3

Thickening	$0.03
Clarifying and precipitating of 2.2 tons solution per ton ore @ 5c.	0.11
One filtration	0.055
Total	$0.195

Flow Sheet No. 4

Thickening	$0.02
Clarifying and precipitating as above	0.11
One filtration	0.055
Total	$0.185

In the matter of costs it must be borne in mind that, in the absence of a standard method of cost accounting among the various mines, it is difficult to make comparisons. For instance, on large-scale operations the cost of counter-current decantation in 1923 was $0.0276 for four washes, and at this same mine the clarification and precipitation cost on a precipitation ratio of 1.76 to 1 was $0.0454 per ton of ore milled. This was at the Hollinger on an average of 3,476 tons of ore per day. On the other hand, the annual report of another mine for 1922 on an average of approximately 530 tons per day was as follows: Thickening (in five steps), $0.05 per ton; clarification and precipitation, $0.12 per ton of ore. The latter conditions being more nearly in line with the tonnage being discussed here, I used these costs as a basis for comparison. On larger-scale operations the costs will be considerably less all around, provided everything else is equal. As an instance of this the cost of continuous vacuum filtration, re-pulping of cake and pumping to waste at the Hollinger at present is $0.044 per ton of solids.

Some engineers will maintain that the dissolved gold losses in decantation may be reduced by increasing the precipitation ratio, which is quite true, but this increases the operating costs and automatically reduces the capacity of the thickeners. These factors must be carefully balanced to determine the best method of operation in each individual case.

Factors Governing Capacity

The capacity of continuous vacuum filters varies widely when operating on different ores. Also, there is a wide variation in capacity on any given pulp at different densities of feed. The largest factor controlling the cost of continuous vacuum filtration is the capacity obtained per square foot of filter area. Where it is desired to determine the advisability of installing filters of this type in operating plants, it is easy to find the capacity per square foot on any given pulp by running tests with experimental filters supplied by the manufacturers at small cost. When plants are to be erected in an entirely new field, it is difficult to determine the settling area required for any specified tonnage because it is practically impossible to duplicate in the laboratory a pulp of the exact characteristics of that to be produced later on a commercial scale. The factors controlling the settling rate and filtering rate of any pulp are practically identical; in other words, a pulp that has a rapid settling rate has also a high filtering rate, and vice versa. The engineer designing a mill in an entirely new field must therefore take the results from the laboratory tests as a rough guide only, and then use his best judgment in determining a proper safety factor in figuring settling area and filter area for the tonnage desired.

Where the project is large enough to warrant the erection of a pilot test mill at the mine, and the development of the mine has progressed to the stage where it is possible to send representative ore to the pilot mill, it is possible to arrive at the exact filter area and settling area required for the ore to be treated. Too often, however, mills are built before the mines have reached a sufficient stage of development to permit the engineer to get a representative sample. Not being endowed with supernatural gifts, the engineer must be guided by the results he obtains from the ore exposed for test purposes.

The first cyanide plant built in Canada employing continuous vacuum filters operating in series was the one I designed for Argonaut Gold, Ltd., at Dane, Ontario. To the best of my knowledge there are no other plants using this process at present. If there are, I should be pleased to have a report on their performance. As this is being written, one of the largest gold-mining companies in the Porcupine district is preparing plans for a large plant of this type, and no doubt other companies will do likewise.

Leaching at the Ohio Copper Mine in Bingham Canyon, Utah

Solution gradually disappearing in the caved surface

The Petroleum Situation as Viewed from the Pacific Coast

An Inquiry Into the Causes Underlying the Present Condition of the Market

By J. Volney Lewis
Professor of Geology, Rutgers College, New Brunswick, N. J.

NOT TOO MUCH OIL, but wasteful and excessive extraction of it, is the malady from which the petroleum industry suffers. Stocks greatly in excess of those of one year ago are now held in both of the great producing regions, California and the Mid-Continent; and the total amount in storage throughout the country on July 1 was equivalent to 171 days' supply, in contrast with only 151 days' surplus on the same date last year. More than 3,000,000 bbl. per month was added to these stocks during the first half of 1924.

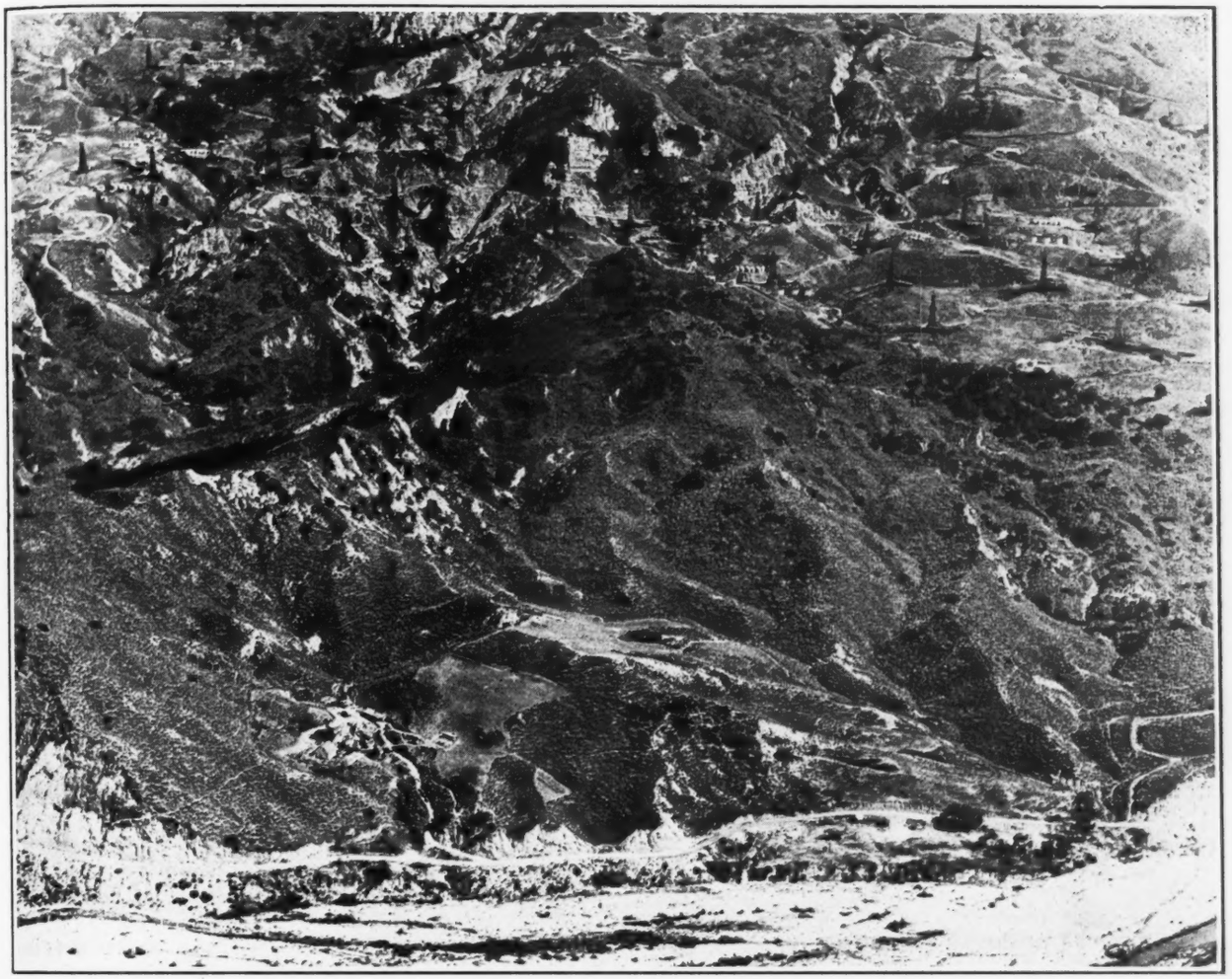
After a frenzied year, California shows signs of returning composure, thanks to the gradual decline of the flush southern fields; but whatever comfort may be drawn from this circumstance must rest on the hope that Nature will not immediately loose again the demoralizing floods. The sobering-up process is slow and uncertain and is aggravated by serious symptoms of relapse. Since March 1 the decline of the chief fields in the Los Angeles basin has been practically neutralized by the rapidly mounting output of newer fields in the same region, together with reopened production in the San Joaquin Valley.

Up to Aug. 1 California production averaged 22,000 bbl. per day less in 1924 than in 1923. But this does not tell the whole story, for in the same period stocks were increased by 9,541,000 bbl., bringing the total storage held in the state to 101,466,000 bbl., which is nearly 23,000,000 bbl. in excess of stocks one year ago.

"Town Lot" Drilling in Newer Fields

The danger of the same wasteful and demoralizing town-lot drilling that precipitated the debauch of last year now threatens these newer fields. The miniature plots are invariably leased under terms that demand immediate drilling, and so the furious race is on, with

"Forestry" at Signal Hill (Long Beach), California. Six months growth!
Over 7,500,000 bbl. was drawn from this field in October, 1923—225,000 bbl. daily. Declined to 150,000 bbl. per day in August, 1924.



Rugged and picturesque South Mountain field from the air

Along the narrow "pay streak" and across the deep arroyos producing wells are strung out more than a mile, and a gasoline plant is perched high on a pinnacle. Scenic roadways had to be constructed to get in materials.

the prize to the one who gets oil first and the most of it. Five or ten wells are drilled where one would suffice; gas pressure is rapidly exhausted, thereby wasting not only most of the gas itself, but lowering the capacity of the wells and greatly reducing the ultimate recovery from the field.

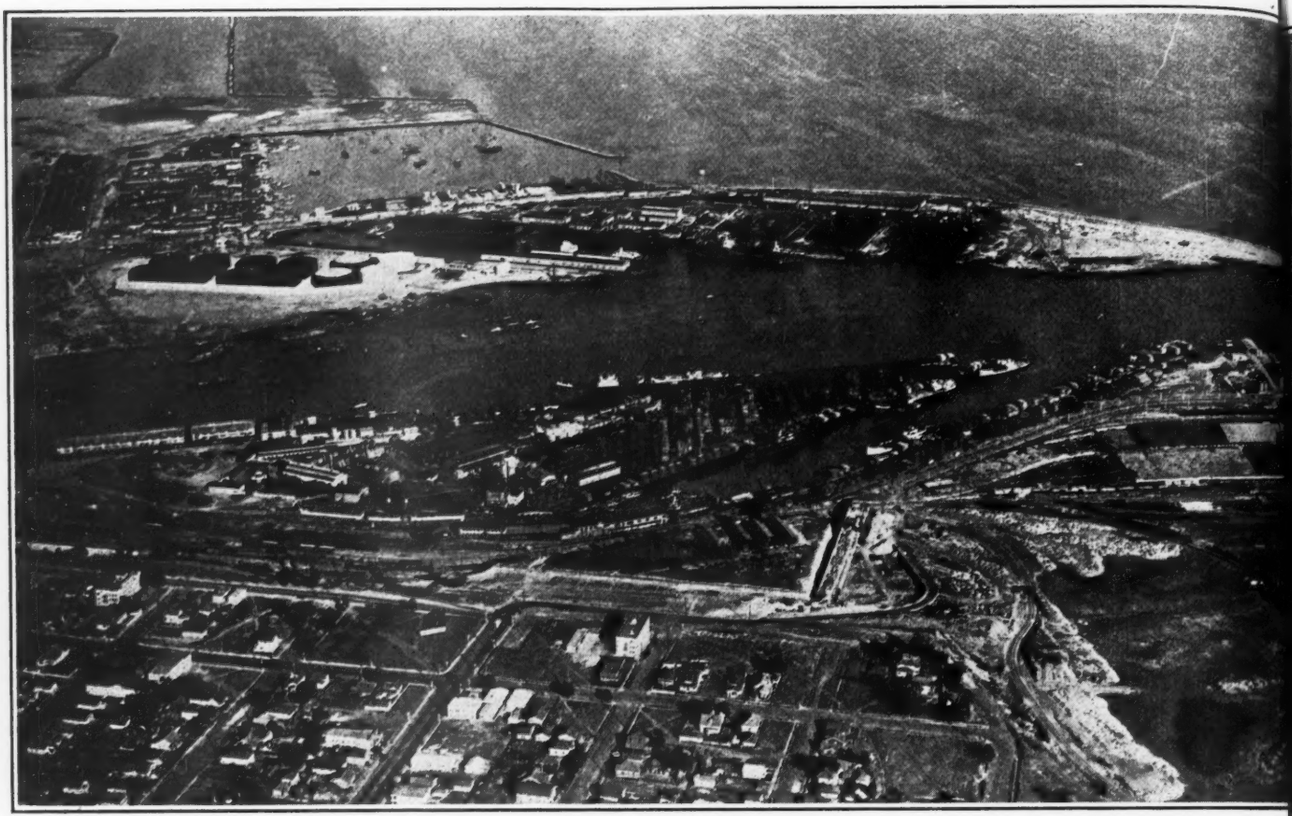
The chief offender just now is the Torrance field, which is following in the footsteps of Sante Fe Springs, Signal Hill, and Huntington Beach. Its daily production is already above 60,000 bbl., and a vigorous drilling program will keep this up for some time. The extension of the Dominguez field and the rise of its production above 20,000 bbl. daily also suggest a definite threat from that quarter, and another frenzy of town-lot drilling is feared in the Rosecrans-Athens area.

Cromwell Field Chief New Factor in Oklahoma

The greatest new factor in the Mid-Continent is the Cromwell field, in Oklahoma, which continues to yield a steadily mounting production of high-gravity oil—the type that has been hardest hit in the repeated price reductions. Now the deep sands at Tonkawa are also adding to the complication, and five fields in Oklahoma are producing monthly more than a million barrels each. Hence the daily output of the state is again above 500,000 bbl. and near the peak production of June, 1923. Only the adverse drilling conditions of fall and winter seem likely to check this excessive flow.

A repetition of last year's orgy of overproduction can be averted by immediate and drastic restriction, but no such restriction is in sight. There is talk of concerted action to reduce competitive drilling, but this seems impossible, and individual producers fear to take the lead. Every barrel of surplus above ground is a source of constant loss, on account of evaporation, interest, and possible depreciation and leakage. Yet so intense is the competition that only ruinously low prices and rigorous proration of pipe-line runs can accomplish an effective program of restriction of production.

These are some of the outstanding factors in the depressed condition of the petroleum industry. Stocks of both crude oil and gasoline continue to accumulate in ever-increasing excess; pipe-line purchasers throughout the great Mid-Continent region are prorating their runs, most of them to 50 per cent; and price cut follows price cut in rapid succession. Small wonder that depression reigns and chaos and ruin seem to threaten the industry. Further cuts in prices may be confidently expected until producers are convinced that continued operation involves greater loss than shutting down.



Los Angeles Harbor, in

This port claims the double distinction of being the world's greatest
Tankers are seen at several of the loading docks, including the million

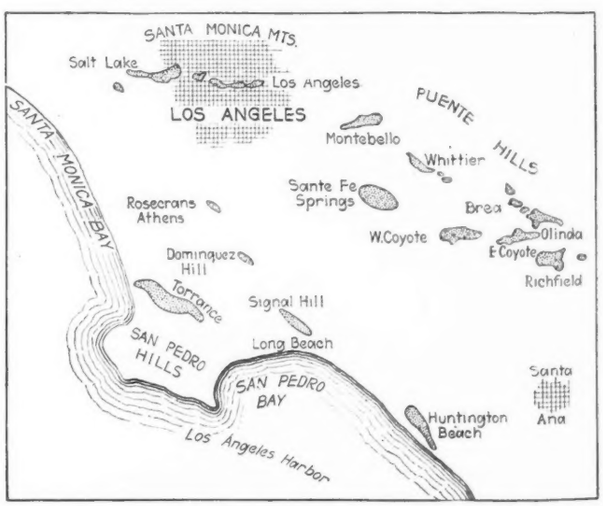
For many small producers either horn of the dilemma means disaster.

Restriction of output in the Los Angeles basin is obviously out of the question; but continued high production, with possibly even an increase, will lead, as it did a year ago, to drastic reduction in the San Joaquin Valley. Already one of the large producers has shut down many wells in the Coalinga field and has announced the intention of further reduction wherever possible. This is doubtless the forerunner of similar action by all the big companies.

Mitigating Factors on the Coast

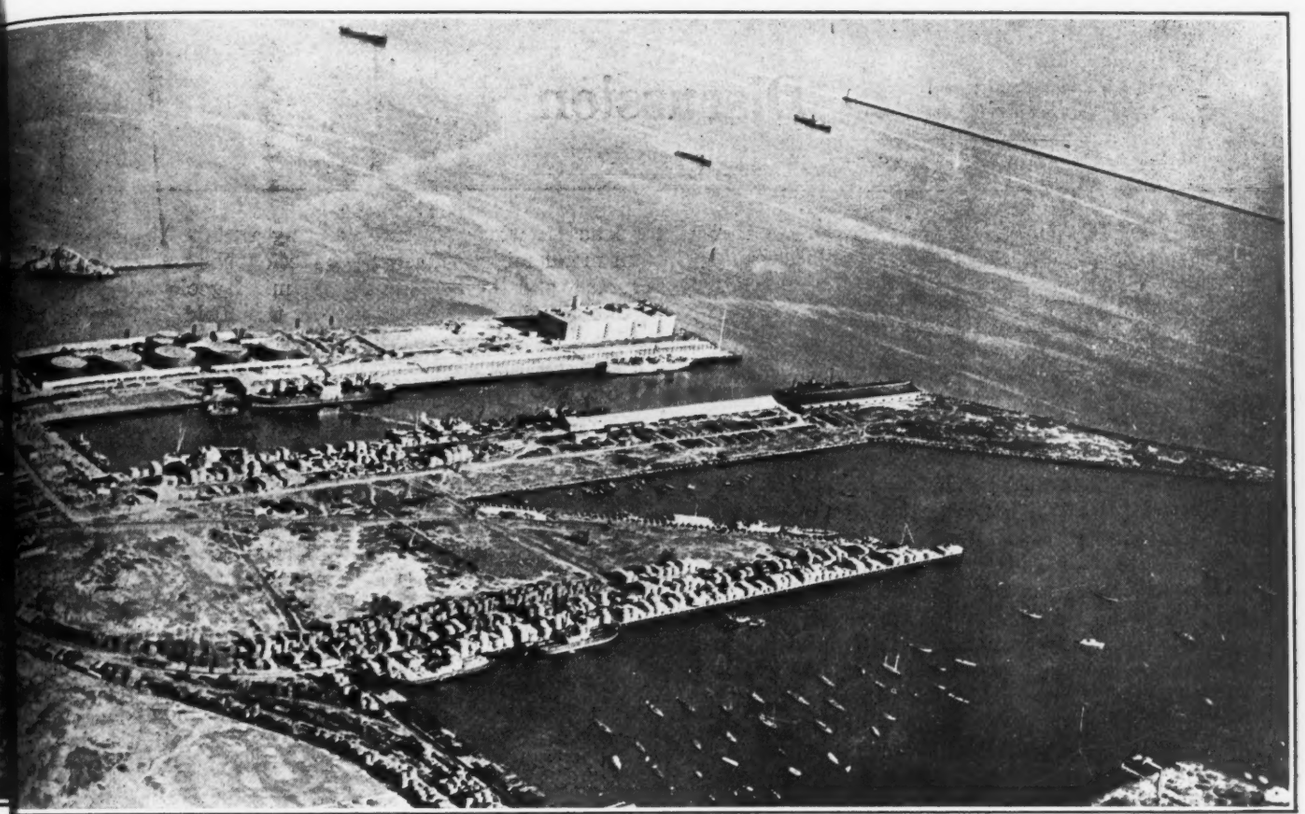
Several factors have mitigated the situation on the Pacific Coast; and crude prices, although low, have been maintained without change since February. Among these factors may be enumerated: (1) The greater demand for gasoline accompanying the peak of the summer tourist season, which now equals, if it does not exceed, the winter season; (2) the deficiency of precipitation and the consequent shortage of hydroelectric power in California, which calls for about 10,000,000 bbl. of fuel oil, against 3,000,000 bbl. last year; (3) an excess of storage capacity, amounting to about 14,000,000 bbl., constructed under the stress of peak production, but never filled. This unused storage is rapidly dwindling, however, and at best can serve only as temporary relief. An element of growing importance in the local demand is also found in the fact that California now leads the country in the number of automobiles owned and operated in the state, the registration being 1,184,015 vehicles on July 1, 1924.

Nevertheless, the danger of price reduction on the Pacific Coast is brought appreciably nearer by the drastic cuts throughout the rest of the country in July and August. When these reductions have reached the point at which California petroleum cannot undersell the Mid-Continent on the Atlantic seaboard, then a corresponding cut in California crude prices will quickly follow.



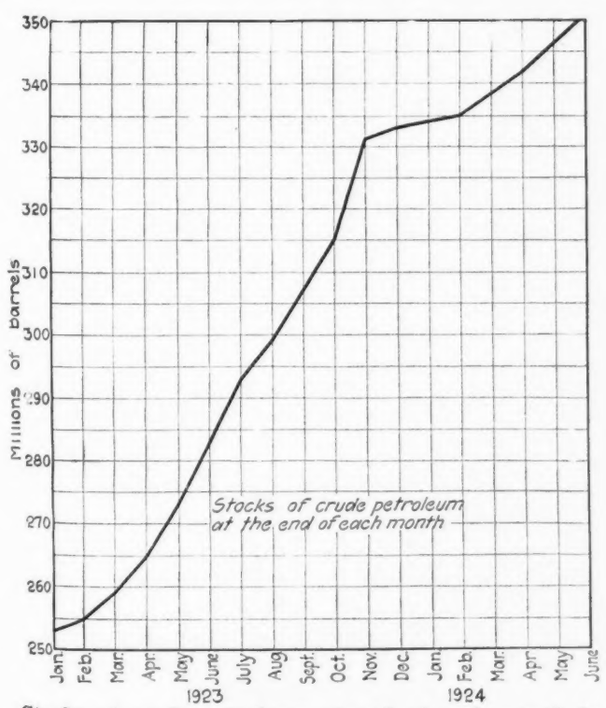
Sketch map of oil fields in the Los Angeles basin

Anent the persistent overproduction and its dangers, *The Oil Age* (August, 1924, pp. 10 and 11) says:



California, from the Air

oil shipping port and the greatest receiving port for lumber. dollar Pan American terminal (right center) of "senatorial" renown



Stocks of crude petroleum at end of each month in 1923 and 1924

"The nearly 500,000,000 bbl. of crude oil and refined oils in storage is breaking the back of the industry. This terrific handicap must be unloaded before the industry can recover and become normal.

"Every monthly report issued by government and industrial agencies for the last ten years shows the piling up of crude oil stocks, until now the total, with normal production from old wells, cannot be exhausted in less than three years, and not then unless greatly restricted operations of producing wells and suspension of drilling new wells is rigorously applied and maintained until all stocks of crude and refined oils are reduced by at least two-thirds."

It is pertinent in this connection to note the startling figures recently given out by E. W. Marland and C. C. Osborn, who have conducted a survey of the industry on behalf of the National Petroleum Marketing Association. They find that the average cost of producing crude petroleum in the United States during the two and a half years ended June 30, 1923, was $2.17 a barrel, counting only the outlay for drilling, lifting, bonuses, and rentals. Expenditures for geological exploration, interest, taxes, and general administration are not included. The average market value of the product, after deducting royalties, was only $1.36 a barrel, showing a clear loss of 81c. a barrel. A wide margin may be allowed for possible errors without changing the essential conditions disclosed by these figures.

Obviously, unrestricted overproduction has been wasteful and inefficient—a condition that every intelligent observer has long known and deplored. In the light of these figures, also, the high mortality among producers, especially the smaller ones, is readily understood. Furthermore, besides the fearful losses incurred in legitimate production, the community at large continues to sink vast sums in inflated and fraudulent oil enterprises.

Discussion

"Engineering and Mining Journal-Press" is not responsible for statements or opinions published under "Discussion." In many cases the views expressed are diametrically opposed to editorial policy and belief.

Geology—A Growing Science

THE EDITOR:

Sir—Your editorial of July 19 entitled "The Microscope and the Decadence of Geology" has come to my attention in my post-field season scanning of accumulated *Journal-Press* literature. The view that the application of the microscope has retarded rather than aided the progress of geology is so entirely opposed to my own interpretation of the facts that I confess to a shock that such a viewpoint can find a champion in a person of ordinary optimism. Neither do I share the belief, also expressed, that the science of geology is in the doldrums of a period of decadence.

It seems to be a natural human frailty to glorify the heroes of the past and their accomplishments and to look at the workers and the events of the day through the wrong end of the opera glass. To see men and events in their just relationships we must stand off from them a bit. There are some features of the present situation of the science that certainly give cause for regret, but not I think for discouragement.

The geological activities of the federal survey and of some state surveys which moved forward in the full vigor of useful accomplishment before the war and with especial vigor during its progress have been notably curtailed since the war. This curtailment, however, is but a part of governmental programs of financial retrenchment inevitable in a post-war period, and may be reasonably expected to give way in due time to activity on a scale even greater than that before the war. Even a temporary curtailment of opportunities for governmental field work is, however, a serious matter to the geologist.

In spite of the malign(?) influence of the microscope the outdoors still remains the geologist's principal research laboratory, but a costly one to work in and one in which he can seldom afford to finance his own researches. In his research the geologist is in the main an opportunist accepting and making the best of the opportunities offered by government agencies and commercial organizations. Rarely is he able on his own initiative to select his research topic. Research foundations which will make such independent choice possible is one of the larger needs of the science of geology.

In the field of petroleum geology there is a present slackening in the demand for geologists—a consequence of a period of large overproduction. From this a rebound to more normal conditions is to be expected, although oil companies—fortunately for them and for the progress of geology—are likely to demand men of more and better training than in the past. The day when the garden variety of geologist can attain high success in the petroleum field is probably gone, and here as elsewhere special training will be demanded.

In metal mining normal production has not yet been resumed, and the demand for technical geologic service is temporarily curtailed; yet in this field a growing tendency is obvious to attach geologists as permanent members of the staffs of mining companies.

No proper perspective of the status of a science can, however, be gained by considering only the abnormal years following the World War. What of the last twenty-five years? That period has been the world's "age of minerals." Within that period more minerals have been quarried, mined, or pumped from the earth than in all previous human history. What aid has geology afforded in this astounding activity? Within that period has developed almost *de novo* the modern science of ore deposits, which is not content with the cataloging and describing of ore deposits, but is especially concerned with diagnosing their origin as affording the best key to intelligent development and to exploration for new deposits. This information is no longer in the hands merely of a few specialists, but has been disseminated through numerous modern textbooks and through geologic instruction in mining schools to mining engineers the world over. The aggregate effect of this diluted percolation of scientific results to the men who are in a strategic position to apply them is easy to overlook and difficult to evaluate, but its influence has been immense. Within this period has developed mainly our knowledge of the intimate relations in origin between ores and igneous rock, with its train of influences in the diagnosis of the origin of the ores and of their probable extent in depth and areally. Within this period has developed wholly the detailed study of the composition of mine waters and the alterations affected by them in wall rocks as an aid in diagnosing the conditions under which ores were deposited.

In the study of wall-rock alterations in particular the microscope has been an indispensable aid. Within this twenty-five years has developed our knowledge of the alteration of ore deposits by surface processes, with its train of important applications in the development of copper and silver deposits. Further progress within the last ten years has demonstrated that many rich copper and silver ores formerly thought to result mainly from near surface processes of alteration are in the main primary deposits from solutions ascending from great depths. This knowledge is already bearing fruit in the encouragement which it offers to deep exploration. This advance in particular has been made possible mainly by the reflecting microscope, for without its aid it is ordinarily impossible to differentiate fully primary and secondary minerals.

In the interpretation of microscopic ore textures, mistakes have been made, as is inevitable in any new and difficult field, but criteria for distinguishing primary from secondary minerals are being established that will make future results secure. In some instances microscopic work has not been sufficiently supplemented

by field work, usually because of lack of opportunity rather than lack of desire. In other instances regions well known from field studies have been revisited and collections made for microscopic study to supplement the field evidence—with results that justified the method. In most instances—and this is obviously the ideal practice—deposits have been studied carefully in the field and the field results supplemented by microscopic work. The latter is commonly time-consuming, and the voluminous reporting of its details attracts perhaps more attention than its relative importance merits.

Of less economic import but worthy of mention in this connection is the knowledge which has been gained by the microscopic study of iron ores in the rôle of bacteria and other organisms in iron deposition and the nature of the primitive life that flourished in Pre-Cambrian times. Also the knowledge that flowering plants existed millions of years earlier than was formerly supposed—gained through the microscopic study of coal balls. Both these classes of investigation were byproducts of field work in mining districts.

During the last fifteen years has developed the demand for geological knowledge in the search for and development of oil fields. Of the new oil pools found in Oklahoma in 1913-1917, three-fourths were located on geologic advice. Of the wells drilled in new territory on geologic advice one out of three struck oil, whereas of those drilled without geologic advice only one out of one hundred and fifty was successful. Today nearly all the large oil companies have geologists on their staffs. Among the latest developments is the application of the microscope to the identification of rock formations by the mineral content and the minute fossils found in oil-well cuttings.

Thus far I have purposely dwelt mainly on those phases of geology of greatest economic application, but the progress or decadence of a science cannot be measured in these terms alone. No problems stimulate human curiosity more deeply and more generally than the "whence" and "whither" of man and his habitat—the earth. In this field, involving both geology and astronomy, extraordinary progress has been made in the present generation through the development of the planetesimal hypothesis of the origin of the earth and of the solar system of which it forms a part, in opposition to the Laplacian hypothesis which dominated the cosmic philosophy of the preceding generation. The new hypothesis postulates an earth in the main solid and relatively cool from its initiation rather than liquid or gaseous and relatively hot. It implies moderate rather than extreme variations in the physical environment of life, stability rather than catastrophe in the past and in the future, and bears significantly upon the future destiny of life on the earth, including man.

Within the last few years concepts of the duration of geologic time have been immensely extended. Measurements based upon observed thickness of sediments and their estimated rate of deposition have been supplemented by others based upon the degree and rate of dissociation of radioactive substances—determinations based partly on microscopic studies. As a result, the time since living forms appeared on the earth in well-developed variety must now apparently be estimated in figures of the order of hundreds of millions of years instead of the much shorter period formerly accepted.

Within recent years there has taken place a tremendous extension of knowledge of world distribution of the geologic formations, accomplished mainly by governmental surveys. Hand in hand with these has gone studies of the fossil faunas which they contain. These studies have found practical application in exploration for oil, coal, phosphates, and other useful resources, and, incidentally, have made possible approximate reconstructions of the distribution of land and water at many periods in earth history—the new science of palæogeography.

I have cited a few examples of recent advancements in geology; to those who would follow the story further, T. C. Chamberlin's "Seventy-five Years of American Geology," printed in *Science* for Feb. 8, 1924, is commended.

In the education of professional geologists I cannot speak for other institutions. At the University of Chicago certainly there has been no slackening of the demand for professional geologic training. This year there were twenty-one applications for fellowships in geology—more than ever before. Last year the number of graduate students—thirty-five—slightly exceeded previous records.

This does not seem to me to tell a story of decadence, but rather of a science still youthful and vigorous and eager to avail itself of every facility, whether of microscope, of gravity balance, or of seismograph, whether of laboratory or of field work, that points the way to progress. I have no desire to look at the science through rose-tinted glasses, but I have no community of feeling with those who on a dull day would deny the sunshine.

The science of geology is passing, as the older sciences passed before it, from the stage where the fancy of the geologist-philosopher could roam unchecked by many facts to the stage of patient accumulation of observational data. We shall need and we shall find our new geologic philosophers, but they will not sketch their theories recklessly with "magnificent broad perspective," but will build them slowly but securely out of the assembled blocks of the observations of their fellows.

EDSON S. BASTIN.

University of Chicago.

The Story of a Quicksilver Mine

THE EDITOR:

Sir—In answer to your query, I may say that I was one of the first men to know anything about the Terlingua quicksilver. I think I first saw a piece of ore which was brought to me by a Mexican in 1893-1894, and although I made several attempts to locate the ore in place, it was not until 1896 that I was able to do so. In a country that had not been properly surveyed, and with private individuals owning every alternate section, my partner, Montroyd Sharpe, of Santa Cruz, Calif., and I had great trouble in locating ourselves on state land, and it was not until the summer of 1898 that we actually were sure of our ground. With two sections which we bought, we owned about 2,500 acres of cinnabar land, four miles along the strike of the belt. In 1899, we put up our first ten-ton Scott furnace, and, I believe, made a record in production. In 1901, we doubled our furnace capacity and at one time were running out more "quick" than the New Almaden, it being no unusual thing for two "tens" to run out over 100 flasks every month.

We were lucky enough to get Normand Bros., of Marfa, Tex., interested with us, and the four of us

controlled the Marfa & Mariposa mine, as we called our mine. We sold no stock and ran it ourselves for ourselves. My share of the work was that of general superintendent. The furnaces were put up by Scott himself while I was in charge; also the aërial tramway, the telephone line to Marfa, 90 miles, and the wagon road to the same place, 100 miles. The mine was a success from the beginning; the overhead was possibly lower than that of any mine in the United States. All the profits came out of the mine and not out of the shareholders' pockets.

I have been looking for a second Mariposa. I have been to Idaho, Washington, Mexico, and last year to the Kuskokwim, Alaska, and have not been able to find what I want. As we found several "kidneys" in Texas that assayed over 79 per cent quicksilver, you can understand how difficult it is to find a duplicate. One of these kidneys weighed forty-five tons. I have a picture of Robert Scott surrounded with this bonanza ore, and a piece of the ore is in the Museum of Mines at Victoria, B. C. THOMAS GOLBY.

Cadboro Bay, B. C., Canada.

Land Office Regulations

THE EDITOR:

Sir—In your issue of April 19, 1924, there was an article with reference to a letter received from B. A. McAllaster, Land Commissioner of the Southern Pacific and Central Pacific railroads, concerning the procedure in the filing of selection lists by the railroad companies. The gist of this was to the effect that it has always been the practice of the railroad companies to have an examination made of lands before filing their selection lists, and that on this account it was not the policy of the railroad companies to select lands that were being claimed and worked for mineral.

As a matter of fact, it has always been the practice of the railroad companies to file their selection lists without making examination of the lands, and the result has been that these lists very often embrace lands that are not only mineral in character but that have been claimed and worked by miners and prospectors for years, and that frequently have valuable improvements thereon. Were it not for the fact that it has been the policy of the General Land Office to have examinations made of practically all of the lands selected by the railroad companies before issuing patents, the railroads would have secured title to many tracts of land that were being worked for mineral. Because of this situation, miners and prospectors having claims within the railroad land-grant limits in the states of Nevada and California have always been put to a great deal of trouble and expense in prospecting their claims, notwithstanding the fact that this office has vigorously prosecuted the cases and has borne most of the expense of such prosecutions.

It will probably be of considerable interest to the persons concerned in mining to know that new regulations have recently been issued by the Secretary of the Interior through the Commissioner of the General Land Office, changing the previous practice and compelling railroad companies to file with each of their selection lists an affidavit showing that the lands selected have actually been examined on the ground, and that they are not only not valuable for mineral, but are not claimed or worked for mining purposes.

San Francisco, Calif. J. H. FAVORITE,
Chief of Field Division, General Land Office.

Wind Action in the Desert

THE EDITOR:

Sir—My attention has been directed to a bulletin that refers to the matter of "Investigation of the Dust Content of the Atmosphere," by H. H. Kimball and L. F. Hand, issued by the U. S. Department of Agriculture Weather Bureau. On Plate I, B, opposite page 138, there appears a photomicrograph of dust recorded at the Washington Monument which shows individual crystals of calcite, gypsum, and soot from smoke.

I expect that if it were possible to earmark the crystals of calcite and gypsum in somewhat the fashion that is done in tracing up the habitat of the fish of the sea, perhaps some of them would be found to have had their place of origin in the desert regions of the West.

One of the things that has been very forcibly impressed upon me here in Nevada, particularly after a heavy wind storm that almost blinds one with dust, is that whatever dust may settle locally contains an abnormal quantity of alkaline salts, as I have observed. Of particular interest with respect to geology in this connection is the fact that the incrustations of alkaline salts of the deserts are constantly changing, and not a fixed matter, as might be supposed. It has come to my attention in certain instances that analyses made of the salts of alkaline flats about thirty-five years ago are not the same as those which tests show at this time, and I suspect that the difference may in a great measure be accounted for by the fact that much of the former content that is now absent may be due to removal by the violent winds that come up seasonally.

It is not necessary to point out that the lighter particles of alkali salts would be those which would supply the greater amount of salts removed from the alkaline flats, and as a result the heavier particles of alkaline salts remaining would give somewhat different analysis after each succeeding wind storm. Herein lies a matter that is laden with much that is of special interest, for is it not advisable for the geologist to know just what does take place in the matter of changes of the composition of such salts? I suspect that where some flats have formed crusts that are harder than the surrounding incrustations, such a condition is due to the removal of certain salts theretofore contained through the agency of the winds. JOHN T. REID.

Lovelock, Nev.

Snow Melting Over Ore Outcrops

THE EDITOR:

Sir—Just a line to you. You may know most of the little tricks that the prospector is on to by which we used to find orebodies and ledges. I may be telling you something that you have seen or heard before. In Aug. 30, 1924, issue of the *Mining Journal-Press*, page 343, there was a letter by Henry C. Demming. I agree all along the line with him. Where lightning kills the trees, try holding a compass edgeways, and you will see the compass needle turn like a wheel. Where there are no trees growing I sometimes try out the compass and sometimes find a ledge or iron capping. Another pointer—where we have a light snowfall, say four or five inches, in a mineral belt, I have often seen the snow melt first where there is a ledge, and sometimes the ledges are covered over several feet with overburden. E. B. FOSTER.

Kingman, Ariz.

News of the Week

The Mining News of ENGINEERING AND MINING JOURNAL-PRESS is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

Summary

AMERICAN INTERESTS represented by W. A. Harriman & Co. have acquired a twenty-five-year concession on large and rich manganese deposits in the Republic of Georgia, both the Georgian and Russian governments confirming the transaction.

Granby Consolidated is considering the advisability of abandoning pyritic smelting of its copper concentrate at Anyox.

The Federal Trade Commission has declared the aluminum industry to be monopolized by the Aluminum Company of America, the tariff being a factor in maintaining a high price level.

Michigan mining companies find that they have plenty of competent miners for underground work and will not employ inexperienced men.

Starting of the volatilization section of its new plant is announced by the Chief Consolidated Mining Co. at Eureka, Utah.

Mining men in Canada want a report by a competent engineer on the Bingo Mines venture, in northern Manitoba.

A second disastrous fire within fifteen months virtually has destroyed the town of Goldfield, Nev. The Goldfield Hotel building escaped destruction.

Montana Tonopah Gets Funds for Development of Gipsy Queen

Promising Lease Below 1,500 Level—Ore in Halifax Tonopah Ground Looks Good

It is reported that the reorganized Montana Tonopah Mining Co. has been adequately financed for deep operation through the sale of a $300,000 bond issue. This company has an agreement with the Gipsy Queen Mining Co. which allows it to use the Gipsy Queen shaft and gives it a lease on territory below the 1,500 level. Shaft repair work was started several months ago and work completed to the water level, but lack of sufficient capital for the purchase and installation of suitable pumping equipment has delayed this important work. The Gipsy Queen shaft is well located for the exploration of the easterly extension of the vein, being worked in the Tonopah Extension property farther to the west.

A leaser in the Halifax Tonopah mine, in the eastern part of the Tonopah district, has encountered a new orebody in driving a raise from the 1,100 level. This ore was only recently discovered, and very little work accomplished to date. It appears to be a well-defined ledge, with an east-west strike, normal for the district. The ore is shipping grade so far, and as the ore in the Halifax mine has always been of high grade, the new strike is regarded as important.

Leadville Mines Co. Sinks

At the property of the Leadville Mines Co., near Gerlach, Nev., on the Western Pacific R.R., 60 tons of lead-silver ore is being mined and milled daily. The ore averages 5 per cent lead and 25 oz. silver per ton, and a concentrate is produced which has a value of about $175 per ton. Development work on the vein continues satisfactory and shaft sinking below the 600 level is progressing normally.

Flyer Lowell Smith, Ex-Miner, Gets Loving Cup of Nevada Silver

THE people of Battle Mountain, Nev., friends and acquaintances of Lieutenant Lowell H. Smith, who commanded the round-the-world fliers, have had a loving cup made for him from silver out of the Betty O'Neal mine. Lieutenant Smith worked at the Betty O'Neal mine prior to his enlistment in the aviation corps during the World War, and was well known in Battle Mountain.

The original flight plan provided for a stop at Battle Mountain, at which time it had been planned to present the loving cup to Lieutenant Smith, but changes in the fliers' route made this impossible.

United Verde Extension Increases Monthly Copper Production

The United Verde Extension is turning out more than 4,000,000 lb. of copper a month, from its smelter at Clemenceau, Ariz., a gain of about 500,000 lb. over previous monthly records. For the first eight months of the year the gross output was 28,737,000 lb., about 600,000 above the figures for the corresponding period of 1923.

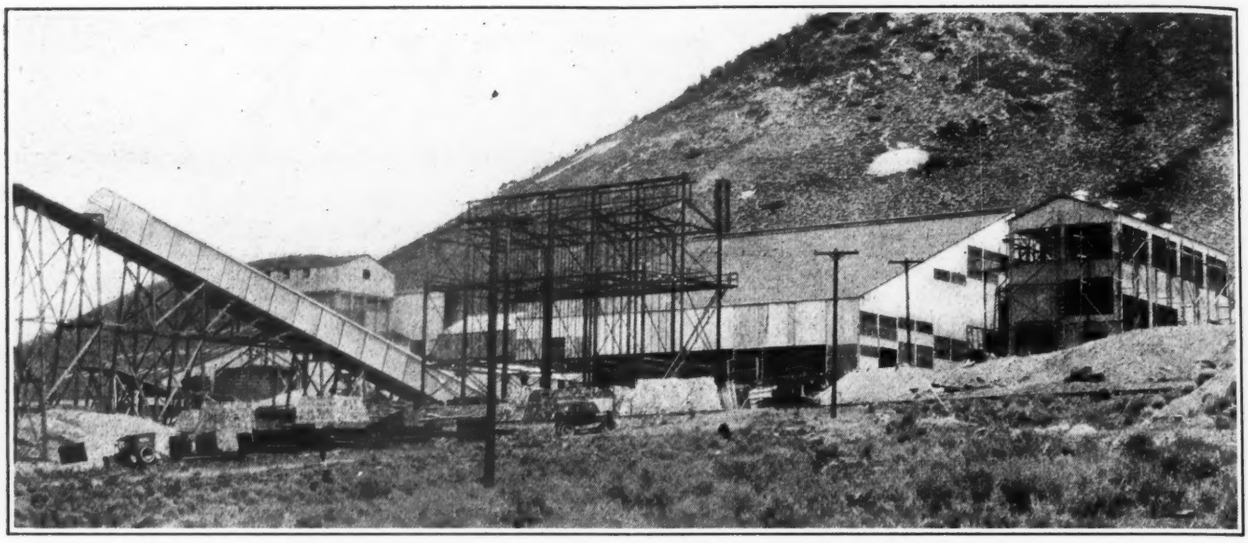
Granby Likely to Abandon Pyritic Smelting at Anyox

Success of New Concentrator and Cost of Fuel Factors—"Flux" Mines Shut Down

The Granby Consolidated Mining, Smelting & Power Co. is likely to abandon pyritic smelting at Anyox, B. C., and to extend its concentrating plant. The company has had this project under consideration for some time, largely on account of the excessive cost of coal, and since the marked success of the new concentrator has been demonstrated, the advisability of such a change has come more prominently to the front. D. D. Moffatt, of the Utah Copper Co., is now in British Columbia for the purpose of advising on the question.

The Granby company has decided to relinquish its options on the Eagle and Anaconda groups, adjoining its Outsider mine, at Maple Bay, Portland Canal, and it will close its Rambler quartz mine during the winter. These decisions tend to show that already the company is favoring the change to concentration, as the Eagle and Anaconda groups contain siliceous ore that is more valuable for its fluxing properties than for its copper content. The Rambler mine ore is practically a straight flux, sometimes containing small quantities of gold, but not enough to make profitable ore.

A considerable amount of diamond drilling has been done on the Eagle and Anaconda groups, the result of which, however, has not been announced. The company is continuing the tunnel at the Bonanza group, 1½ miles west of Anyox. This is believed to be the only outside exploration that it is doing.



New Chief Consolidated plant as it appeared in August
The concentrator is in the background, the volatilizing plant in the center, and the baghouse—uncompleted—in the foreground The conveyor in the foreground is for disposal of tailing

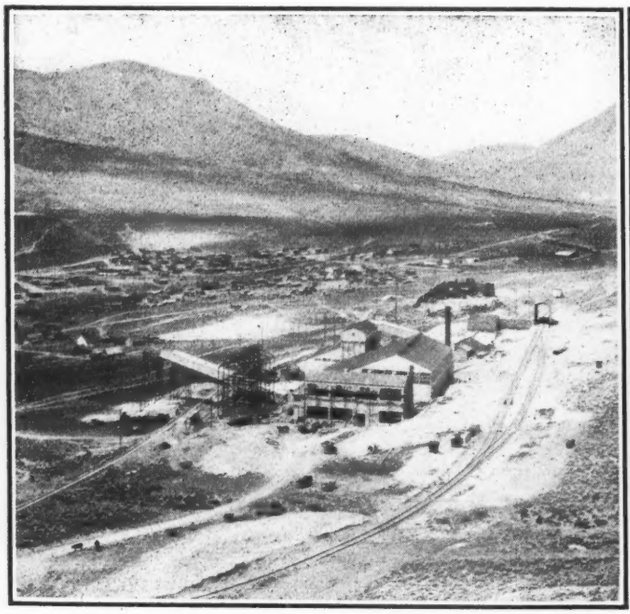
Chief Consolidated Starts Novel Reduction Plant

Flotation, Tabling, and "Oxide" Volatilization Combined—Should Solve Long-standing Treatment Problem— Well Constructed Plant

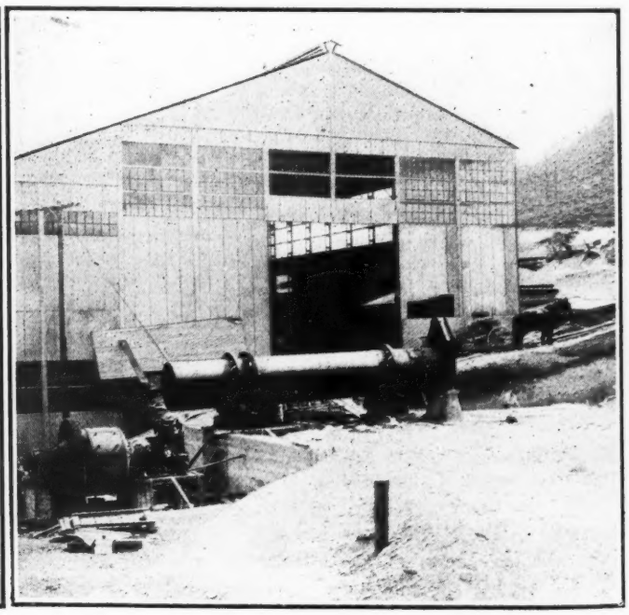
By **Arthur B. Parsons**
Assistant Editor

EIGHT YEARS of research and experimental operation finally has borne fruit in the completion of the new 150-ton metallurgical plant of the Chief Consolidated Mining Co. at Eureka, Utah. The combination of the processes to be used is probably unique. It includes flotation, table concentration, and "oxide" volatilization, the product of all three operations to be mixed to form a high-grade silver-gold-lead-copper concentrate, for shipment. The novel and most interesting feature of the process is the volatilization, which is accomplished without the aid of salt or other reagents. A temperature of 2,400 deg. F. is applied in a rotary-kiln furnace similar to the furnaces used in the portland cement industry, except that it is only about half as long. This has been found to effect a high recovery of the lead and precious metals remaining in the concentrator tailing. At the same time the concentration is an essential step, for the reason that more easily fusible sulphides must be removed to prevent sintering or fusing that otherwise would occur at this high temperature and interfere with efficient volatilization.

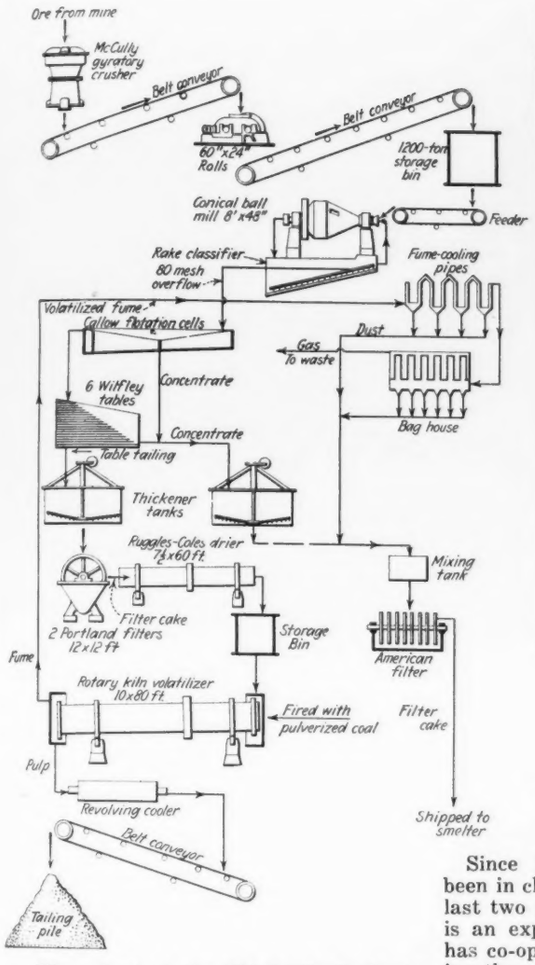
Heretofore, the company has shipped directly to the smelters in Salt Lake Valley three classes of ore: lead, dry (copper), and zinc-lead. The ores are complex, however, and high smelter charges and penalties for zinc and excess silica cut seriously into profits. For example, net smelter returns in 1923 on 134,312 tons of ore totaled $3 363,935, although, thanks to the Pittman Act, the selling price of silver averaged 87c., and other metal prices were good. Ignoring lead in dry ores, the following table shows the production:



View of the plant from the mine settlement



Coal-pulverizing equipment in process of erection

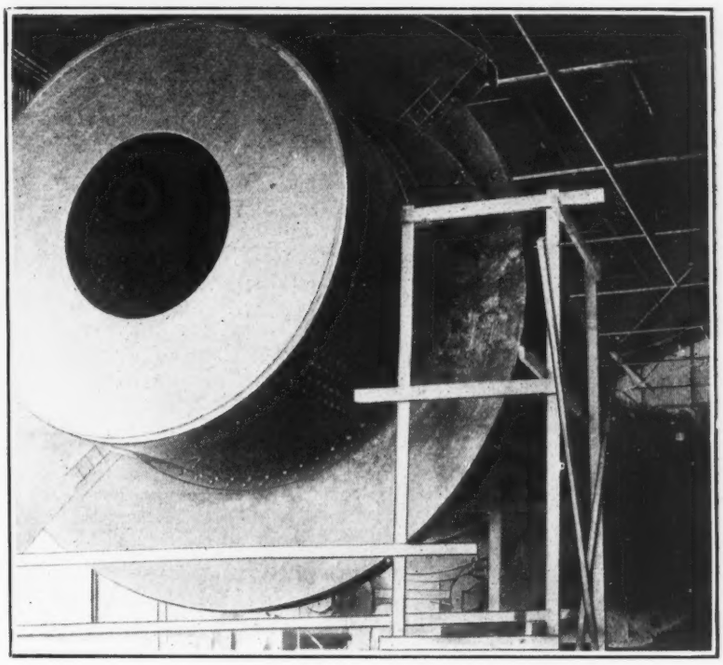


Flow sheet of the Chief "Con" plant

Metal	Quantity	Average Price	Gross Value
Gold	13,145 oz.	$20.67	$271,707
Silver	4,025,792 oz.	.87	3,502,439
Lead	26,498,897 lb.	.074	1,960,918
Copper	1,068,597 lb.	.151	161,358
Total			$5,896,422

Smelter charges and losses and freight therefore absorbed a total of $2,533,487, or about $19.50 per ton on ore averaging $45.54 in gross value. These figures indicate the need for devising a process for treating the ore at the mine. The decline in the price of silver has aggravated the situation, and, in conjunction with a decline in the average metal content of ore mined, has made shipping under the present smelter contract unprofitable. The company's report for the second quarter of this year shows a loss of $23,810. Incidently, I understand that a new and more favorable contract goes into effect at the beginning of 1925.

Walter Fitch, president of the company, and his staff foresaw ten years ago that the time would come when the large deposits of comparative low-grade ore would have to be mined. They saw that treatment at the mine would be essential, and he established a research department to develop a process meeting the peculiar needs of the complex ores, part of which are oxidized and part mixed oxide and sulphide in character. The comparatively high lime content of the ore made the use of the chloridizing roast and acid-brine leaching process as used by the Tintic Standard company unsuitable.



Volatilization furnace, 10 by 80 ft.

Lead, silver and gold are driven off as fume by heating to 2,400 deg. F. in this shortened "cement" kiln

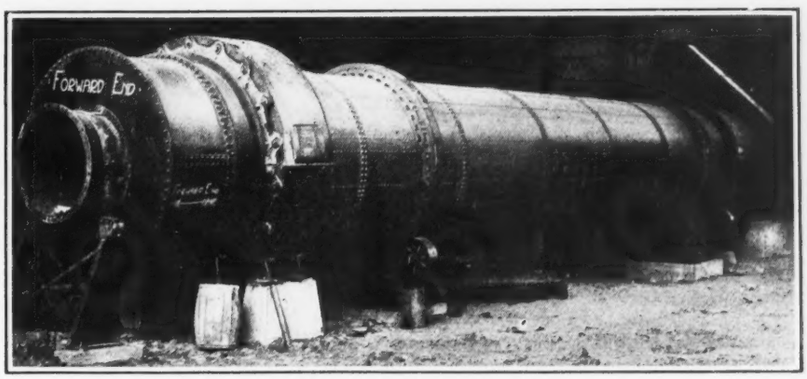
Since 1916 George H. Wigton has been in charge of this work, and for the last two years Samuel M. Sudden, who is an expert in cement-kiln operation, has co-operated in designing and building the new plant. It is a modern structure in every way and embodies many devices for the economical handling of the various products. The electrical equipment is a feature to which particular attention has been paid: and the results show it. Messrs. Wigton and Sudden doubtless will publish details of their work later; but a brief outline will give a general idea of the process and the equipment to be used.

One of the accompanying illustrations shows the railroad tracks over which the ore is delivered in standard-gage cars to the mill bins. The coarse crushing equipment includes a 13-in. McCully gyratory and a set of Worthington rolls, 24x60 in. The product, crushed to pass a ¾-in. screen, is conveyed to a 1,200-ton storage bin, over which is an automatic distributor that effects uniform mixing of the ore.

The ball mill in closed circuit with a rake classifier grinds the ore to 80 mesh, maximum, ready for flotation. The newest design of Callow pneumatic cell is used, most of sulphide minerals being floated. The Wilfley tables serve to recover virtually all of the remaining sulphides and some of the oxidized minerals, in a reasonably high-grade concentrate.

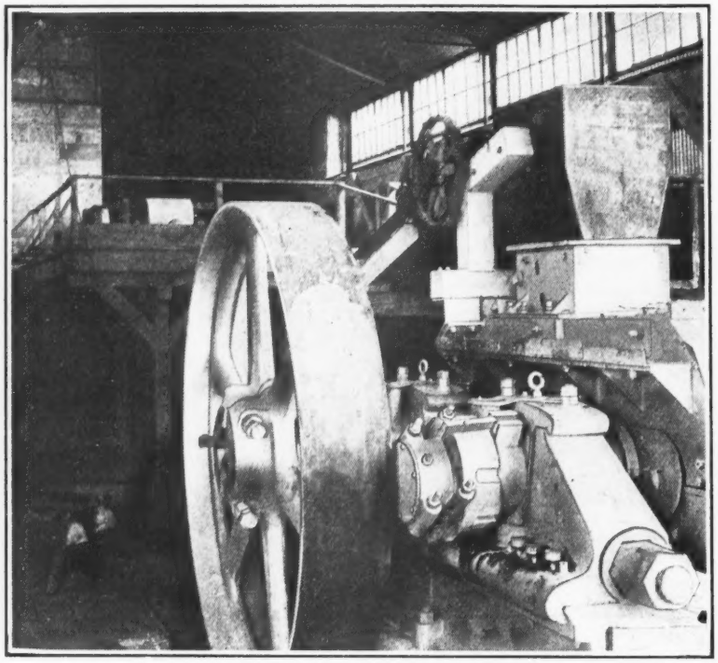
Drying is of course necessary before volatilization of the concentrator tailing. Two 12x12 ft. Portland filters are followed by a Ruggles-Coles drier 7½ ft. in diameter and 60 ft. long, the heat being obtained from the effluent gases from the rotary volatilizing furnace.

This furnace was built especially by the Worthington Corporation, the design being similar to that of a 10-ft. rotary cement kiln, except that it is 80 ft. long instead of 175 or 200. Obviously, as the valuable product is



Rotary drier, 7½ by 60 ft.

Filtered concentrator tailing is dried before being volatilized, using waste heat



A belt conveyor carries the ore from the gyratory crusher to this set of rolls

separated as a fume, the discharge end of the furnace is inclosed to prevent the dissipation of the effluent gas. The lead and silver presumably are volatilized as oxides; as to the gold, all that seems to be certain is that a reasonable percentage is recovered from the ore in some form. The kiln is lined with nine inches of refractory brick, and the speed may be adjusted between one and two revolutions per minute. Pulverized coal is the fuel, a special plant consisting of a Ruggles-Coles drier, Hardinge conical ball mill, and Gayco air separators being provided to prepare the coal for distribution.

The fume-laden gases are drawn by fans through a series of steel cooling pipes having a total surface exposed to the air of 20,000 ft. This is necessary both to complete the precipitation of the metals and to cool the gases to a temperature at which filtering in woolen bags would be safe. The baghouse contains 300 bags 18 in. in diameter and 30 ft. long. Automatic shakers and a system of spiral conveyors for the withdrawal of the precipitated powder are provided.

Mixing the high-grade precipitate with the concentrate from flotation and tabling served to dispose of a finely powdered product that would be difficult to ship and to handle at the smelter. It is possible that briquettes will be made of the mixture, the fine fume serving as a binder.

The flotation department of the plant was finished and started in September, and the volatilization department is nearly ready for operation. The process is not complicated, but if it works as well as is expected it will solve in an ingenious way an exceedingly complicated and difficult problem in ore treatment.

Gold-Mining Activity in Idaho County, Idaho

The historic placer camp of Warren, in Idaho County, Idaho, which produced millions in placer gold, is taking its place as a lode mining district. The Unity Gold Mines Co., operating the Rescue and Giant properties, produced 1,500 oz. of gold from depth in August, according to Thomas Murray, a mine operator of the district.

In the Big Creek district, farther east, Charles Mahan and the Smith brothers are building a stamp mill on their gold property. This will be in operation in a few weeks.

Extreme low water in the creeks and in Salmon River has afforded opportunity for prospectors to snipe the crevices in bedrock and several lucky ones have reported yields of from ½ to 1 oz. per day for their season's work.

Big Fire at Goldfield Second Within Year

THE second disastrous fire in a little more than a year virtually destroyed the town of Goldfield, Nev., on the night of Sept. 29. The fire started about midnight and was soon beyond control because of the lack of water pressure in the fire mains.

The Elks building and the *News* building were destroyed, and Cook's bank building was damaged. The Goldfield hotel was slightly damaged, but the billiard hall is serving as the post office.

Conditions in the district are not of the best, so that it is doubtful if extensive rebuilding will be attempted at this time.

Toronto Letter

By Our Special Correspondent for Northern Ontario

Qualified Engineer Should Report on Bingo Mine

Claims of $3,300,000 Ore Reserves Are Not Official—Talk of Erecting a Cyanide Plant Is Current

Toronto, Oct. 4—Reports have recently been given to the press to the effect that ore reserves in the Bingo mine, in the Herb Lake district of northern Manitoba, amount to more than $3,300,000 and that the company is considering the erection of a cyanide plant. This property has been financed almost entirely in London, and the company has maintained a policy of secrecy at the mines, which is much at variance with ordinary procedure in Canadian mining districts, so that Canadian or American engineers have had no opportunity to go underground and to know whether or not the claims regarding reserves can be substantiated.

The policy of secrecy, and the fact that grab samples taken off the ore dump by a number of different persons are so much at variance with the statements made by the company, have aroused suspicion regarding the actual merits of the property, and it is considered possible that eventually there may be an exposure similar to that in the Davidson property, in Porcupine. This would be an extremely unfortunate circumstance and it would appear that the time has come when a frank report by properly qualified engineers should be demanded. The company has recently appointed J. A. Reid, formerly of the O'Brien mine, at Cobalt, as consulting engineer, and if a report were issued by Mr. Reid which confirmed the statements regarding tonnage and values, suspicions would at once be dissipated.

In connection with the affairs of the Porcupine Davidson Co., which were recently discussed in these columns, two further actions have been entered—one by the Porcupine Davidson against H. H. Sutherland, R. E. Evans, and the Standard Bank of Canada, claiming the books, papers, and bonds belonging to the company and $100,000 damages, and another by the Porcupine Davidson against H. H. Sutherland and Assets & Securities Limited. In the statement of claim it is represented that H. H. Sutherland, as managing director of Porcupine Davidson, was offered and refused the purchase of timber lands to provide timber needed by the company, the price being $4,000. It is stated that Mr. Sutherland, through the Assets & Securities, which he owns or controls, purchased the lands for $4,000 and sold two years' cutting rights to the Davidson for $6,000, without disclosing the ownership of the properties or his part in the transactions. The Porcupine Davidson asks to have this sale set aside, the repayment of all money, and damages.

During August the Vipond mill, in Porcupine, treated 5,078 tons and recovered $47,400.

News from Washington

By PAUL WOOTON
Special Correspondent

Hoover's Success with Commerce Department

Has Developed Co-operative Self-government in Industry—Defends Trade Association—Organization of Commodity Divisions

UNQUESTIONABLY, Herbert Hoover's greatest accomplishment as Secretary of Commerce, and the one which promises greatest return to the public, is his promotion of constructive self-government in industry. He has shown conclusively how these voluntary forces can bring American industry to a new high plane of efficiency. Codes of ethics have been established in many lines of business. Practices that are unfair to the public and to others in the same line of endeavor are being specifically listed and condemned.

Despite all the ultraconservatism that characterizes the captains of industry—many would say they are "hard boiled"—Secretary Hoover broke through the crust of the reticence and has them co-operating with the Government and with one another in an effort to put the economic life of the United States on a higher plane.

An example of what has been done in securing more regular production, more regular employment, the elimination of waste, the maintenance of quality and service, and of securing a decrease in destructive competition and unfair practices is had in the agreement entered into by the associations in the lumber industry. The standards of practice which were agreed upon, in co-operation with the department, are admitted to have been the most profitable step ever taken by that industry.

The Bureau of Foreign and Domestic Commerce receives inquiries at the rate of 7,000 per day. This is ten times the average of three years ago, and represents an increase of 100 per cent over the rate of a year ago, despite some very effective steps to reduce at the source the number of inquiries. Until recently, 50 per cent of all inquiries were answered within forty-eight hours. Now only 38 per cent of the replies are going forward in the two-day period.

One of the main reasons for the remarkable expansion in the use of this bureau unquestionably was the reorganization under which commodity divisions were set up. This form of organization is essential if leadership is to come from industry. The commodity divisions are under the immediate direction of specialists who have wide acquaintance in the industries with which they are familiar. These commodity divisions form the backbone of the bureau. Its other activities are as ribs which join its spinal column.

A notable series of studies is being made by this bureau of those raw materials which are subject to arbitrary control abroad to the detriment of American consumers. The steps which can be taken to protect American consumers from unfair practices in other countries have been set forth in such a way as to promote production in other areas, to stimulate research, and to encourage search for substitutes.

With a display of courage rather uncommon on the part of one holding political office, Secretary Hoover early in his term came to the defense of legitimate trade associations just at the time that these organizations most needed an outstanding champion. Because a few dishonest men had attempted to cloak illegal practices with trade associations, he declined to admit that this constituted justification to harass and discourage those engaged in a great service in the development of higher standards in trade, commerce, and industry. He has done much to clarify the legal position of such organizations.

One of the great assets of the American business man is the statistical service furnished by the Bureau of the Census. Since Mr. Hoover took office there has been rapid expansion in the production of current figures which make available to all interested an accurate picture of the conditions under which operations are being conducted. Facts gathered by 116 trade associations, fifty-five government organizations, and a large number of trade periodicals are compiled in highly serviceable form in the monthly publication "Survey of Current Business." Nearly 1,500 business movements are portrayed through statistical tables, graphic charts and text material. It has popularized the use of index numbers. All industries are put on a comparable basis. General trends of production, stocks on hand, and unfilled orders are available at a glance. The census of manufactures has been brought to a biennial basis. Closer co-operation with industry has been brought about so that the schedules are on an improved level of usefulness.

One of Mr Hoover's major accomplishments came early in his term and grew out of the conference on unemployment. He was able to enlist organizations of employers and employees, state officials, municipal officials, and a large number of public-spirited individuals. A large program of public works was launched, and other steps here taken which gave employment to about two million persons.

Out of the conference grew the study of business cycles. The report issued in the course of this study carried conclusive evidence that periods of depression are the natural outcome of periods of speculation and waste. It is believed that this report has made a sufficiently wide impression to arouse general interest in curbing inflation and booms.

American Interests Get Soviet Manganese Concession

A CONTRACT for a period of 25 years has been signed by Georgian and Russian governments and American interests, involving large and rich manganese properties in the Chicatouri district of the Republic of Georgia. According to authorities the ore of Georgia is superior to that coming from India and Brazil, now the principal sources of world supply. American interests look upon the investment as safe, because the fields are operating under a charter from the Soviet, protecting the property from confiscation, at the same time, making a contract with the private interests valid.

Some of the improvements planned by American capital in the manganese fields are said to be the building of hydro-electric plants for power to operate washing plants, building of smelters to reduce the ore to manganese pigs before shipment, and the introduction of modern mining and transportation facilities. Officials here have estimated that the cost of mining, transporting and loading the ore from the Georgian fields could be reduced 75 per cent with these facilities.

The contract is said to give the Americans the monopoly on the exportation of manganese from Russia, and the fields covered in the agreement comprise an area of 10,000 acres. It is estimated that they contain nearly 100,000,000 tons of ore, which is sufficient to supply the world for many years.

As now being worked by the Soviet engineers the mines are producing 500,000 tons per year, but the Americans will increase this to a million tons, or sufficient to meet two-thirds of the world's requirements.

Some Improvement in Alaskan Railroad Affairs Under Smith

Reports from Alaska indicate that Noel W. Smith is making decided progress in undoing the harm which resulted from the conduct of the government railroad by Lee H. Landis. Although it is very generally regarded that Mr. Smith was sent to Alaska to whitewash the bad record of the management of the line by a political appointee, no one doubts his ability as a railroad executive. His work thus far shows that he can get results even under conditions as difficult as those which were presented on his arrival in Alaska. The improvement unquestionably would be continuous were Mr. Smith in a position to remain as director of the road. It is understood that his stay in Alaska must necessarily be short because of the responsibilities in connection with his position

Quincy Wants No "Green" Men in Its Mine

IN THE employment of miners and trammers, the Quincy Mining Co., operating in the Michigan copper district, has announced it will take none but experienced men. Mines of the district have tried inexperienced men in underground work, but in these days of high costs have found the experiment too expensive. Employment of men of experience is now the rule throughout the district. Men accustomed to mining and underground labor are more content to follow this line of work and they are efficient. The result is a smaller monthly labor turnover and lower mine costs. Experienced men are more plentiful than earlier in the year and the majority of the mines are having less difficulty in supplying their needs.

as a vice-president of the Pennsylvania Railroad.

In connection with the appointment of Mr. Landis it is understood that Secretary Work cannot be blamed entirely, as Mr. Landis was recommended to him in an unqualified manner by a considerable number of responsible railroad men in the United States. Dr. Work's own operatives, however, are understood to have submitted an almost unbelievably adverse report in connection with their investigations of his official acts in Alaska. In turn, Mr. Landis has something of an alibi in the fact that the department heads whom he removed were restored to their positions by Secretary Work. Naturally, this created an impossible situation. The Secretary was forewarned, however, because Major John C. Gotwalls, the capable officer of the Corps of Engineers, who had the courage to face Secretary Work in opposition to his appointee and to decline to serve further under him, made a frank and accurate report respecting the situation.

Greenwood, "Ghost" City of British Columbia, Looks Up

One of the "ghost" cities of British Columbia is showing signs of revival, stimulated by recent mining activity. Greenwood, once a city of 3,500 inhabitants, now boasts about 100 people, made up largely by recent arrivals who are again reopening some of the mines which have lain dormant several years. The Providence mine is working twenty-five men on the lowest levels, mining some very rich silver ore, and has shipped several carloads to the Trail smelter.

In the same camp the Eholt and Spotted Horse have resumed operation and are working several men each on promising showings. The Eholt has made one shipment to the Trail smelter.

West of Rossland the Velvet mine, the scene of extensive operation several years ago, has resumed operation and has already shipped two cars of rich copper ore to the Trail smelter.

London Letter

By W. A. Doman
Special Correspondent

Mondego Valley Tin Syndicate Floats Dredging Subsidiary

Deposit Contains 15,000,000 Yd. of Proved Ore, Is Report—11,000 Tons of Tin—Cinderella Troubles

London, Sept. 23.—Following on my recent reference to tin mining in Portugal comes the announcement that the Mondego Valley Tin Syndicate is to float a subsidiary, the Mondego Tin Dredging Co. The parent undertaking owns twenty-five alluvial claims covering an area of 3,125 acres, and will turn over to the subsidiary eight of these, embracing 1,200 acres in the district of Guarda, in the province of Beira Baixa. The capital is to be £150,000 in 5s. shares. Lake & Currie, consulting engineers, have reported on the property, and prospecting is now being carried out by Herbert Youd. It is reported that borings have shown a workable area exceeding 600 acres at an average depth of 17 ft., containing 15,000,000 to 16,000,000 cu.yd., with an average content of 1.7 lb. black tin per cubic yard, or 11,000 tons of tin ore.

With regard to Spain, the Dome Mining Corporation is being brought to the notice of the public. This gold mining area was not too favorably commented upon in the early days of the present company. Recent reports of boring and other exploratory operations are said to present prospects in a better light. Whatever is taking place at the property, the market is being well looked after, and shares are steadily advancing.

The Cinderella Consolidated (Rand) question seems to be never ending. Application has been made locally to the government to have it worked as a state mine separately, and not in conjunction with the East Rand Proprietary Mines. The problem is one of finance, and no one seems willing or able to put up the money needed.

The Coronation Syndicate (Rand) seems to have come to grief again. The ground appears to be faulted or tilted, and, so far as can be gathered, the pebbles that have been encountered do not yet indicate a reef carrying sufficient gold to constitute a commercial deposit. More capital is required. There was hope of getting the Randfontein reef, but as this dips very steeply, the prospect is thought by some geologists to be none too hopeful.

A squabble has been taking place over the control of the Eileen Alannah Gold Mining Co., Rhodesia. The company has been in existence for a considerable time, and shareholders have become restive at what they term the inaction of the directors. At a meeting held a few days ago, a motion was put forward to turn out the board, but a sufficient number of proxies was not forthcoming to effect this object. As the victory of the board was simply a barren one, four shareholders have been elected as directors, and, being in a majority of one, they naturally control the company. An independent engineer is to be dispatched to the mine, and it is suggested that after his report has been received he may be given a seat on the board.

With regard to the discovery of zinc ore in Spitsbergen, it is now announced that the first cargo has arrived at Tromsoe. It is a bulk sample of 27 tons from two different areas, and is said to be rich in zinc. Though engineers who have examined the property are of the opinion that there are good prospects for the export of ore, working conditions may be difficult, as the country is volcanic.

The Cape Copper Works, at Briton Ferry, South Wales, has been sold to George Cohen, Sons & Co., Ltd., and Elton, Levy & Co. are interested in the purchase. These works, which have been in existence for more than a century and have a capacity of about 12,000 tons of refined copper annually, were closed down in 1920.

If You Must Speculate, Make It Your Regular "Trade"

IN THE tax appeal of J. J. Harrington, of Butte, Mont., a merber of the staff of the Tuolumne Mining Co., the U. S. Board of Tax Appeals has ruled that he is not entitled to a deduction because of losses in the sale of securities, because the loss was not sustained in the operation of a trade or business regularly conducted. He sustained a loss in 1921 in the sale of 10,000 shares of Tuolumne stock, which more than offset his gross income for the year.

The board holds that the expression "trade" or "business" as used in the act with reference to net losses is more limited and restricted than expressions in the 1917 act. The present statute provides that loss to be deductible as a net loss, must not only have been incurred from the operation of a trade or a business, but from a trade or business regularly carried on. A trade or business regularly carried on must be held to mean a vocation and not occasional or isolated transactions.

Youngstown Sheet & Tube Leases Ground Near Bessemer

The property known as the Houghton County Forty, situated just east of Bessemer, Mich., has been leased to the Youngstown Sheet & Tube Co., which owns the lease on the adjoining Keweenaw forties. The orebody on the Keweenaw has been worked from the Youngstown's Palms-Anvil mine. The property recently leased is not known to contain enough ore to warrant sinking a shaft on it, but it can be easily opened up from the Keweenaw workings. The lease provides for a royalty of 25c. per ton, changing to 9½ per cent when the value of the ore is more than $3.50, and also provides that there shall be paid a minimum annual royalty of $5,000.

Situation at the Mines

By Arthur B. Parsons
Assistant Editor

STRAW VOTES may not reflect truly the state of affairs, but they are instructive as indicating the way the wind is blowing. A comparable situation exists in copper mining. The companies generally are concealing their production figures; so, estimates of total current output must be based on the few reliable data that come to hand, with the assumption that they reflect the average policy of the industry. Two particularly significant figures are: Utah Copper 19,500,000 and Anaconda 18,500,000 lb. per month. These represent respective increases of 2,000,000 and 3,000,000 lb. over the production of the same companies two months ago. Last month I called attention to a number of increases, including New Cornelia, United Verde, Copper Range, and Union Minière. United Verde Extension with 4,000,000, Magma with 2,900,000, and Union Minière with a further sensational increase to 20,400,000 lb. in August indicate a decided trend toward greater production. Against these is a comparatively small reduction by Calumet & Hecla, caused by a fire in the conglomerate lode workings. There doubtless are other declines, but it is hard to see anything but a sizable swelling in the current aggregate rate of output compared with that of the summer months.

Copper Producers "Going on Their Own"

The decline in the price during September from 13.25 to 12.62c. has of course affected the current earnings of all producers. It has introduced red ink into some accounts that showed black before, and, in some instances, has made red figures still redder. It looks as though each company is adjusting its output with an eye solely to its individual interests, rather than attempting to influence the general market situation. In general, this would mean to operate on a scale not less than that at which present plant and equipment will give the lowest costs. How much beyond that the company will go depends upon what individual costs may be and upon the policy of the directors as to depleting ore reserves to make copper on what they consider a low market.

The opening of high-grade copper ore east of part of the Continental fault at Butte, in the Main Range mine of the Tuolumne Copper Co., is regarded a highly significant development. North Butte and other companies may profit. On the west side of Butte, Anaconda has developed excellent ore in both the Orphan Girl and Anselmo mines. North Butte is said to have cut a 15 ft. vein on the 600 level of its new copper property near the Magma mine at Superior, Ariz. Utah-Apex at Bingham is another company that has opened a copper oreshoot—this in the lower levels of its well-known "lead" mine. Arrangements are being completed for the leaching of the Keystone dump of the Nevada Consolidated Copper Co. at Ruth. In British Columbia it seems likely that pyritic smelting will be abandoned by Granby, but that the capacity of the new copper concentrator at Anyox would be largely increased.

Lead Companies Pay Dividends

Lead mining is featured by high and regular production, with excellent smelter returns based on a steady market of 8c. Southeast Missouri, Utah, and the Coeur d'Alene, the three leading districts, are thriving. Lead production at Trail, in British Columbia, and at most of the smelters in Mexico is at a high rate. Dividends for the third quarter totaling $700,000 declared by the Tintic Standard, Park City M. & S., and Silver King Coalition companies reflect prosperity in Utah, as does a fourth 15c. distribution by the Ahumada Lead Co., in Mexico. The Peñoles company is shipping from the Mosqueteros, a neighbor of the Ahumada. A lead-silver producer that is giving a good account of itself is the Silver Dyke, situated near Neihart, Mont. The new reduction plant of the Chief Consolidated, at Eureka, Utah, is so successful that the capacity of the flotation department is to be increased at once.

Zinc production in Joplin is at the rate of nearly 16,000 tons of 60 per cent concentrates weekly. This is several thousand in excess of current sales, and on Oct. 4 two companies shut down for the purpose of keeping down the surplus stocks. The price has been cut to $41 per ton for "jack," which parallels a slight drop in the market for slab zinc to 6.15c. on Oct. 1. Just now 144 mines are in active operation, several working night shifts. In the Western zinc-mining districts production is likewise good. Anaconda is planning to increase the recovery from the zinc concentrate treated at Great Falls. About $300,000 has been appropriated for plant additions to make this possible. Fire destroyed the zinc concentrator of the Yellow Pine Mining Co., at Goodsprings, Nev., in September, but reports state that a bigger and better plant will be built. The Combined Metals Co. is increasing its output of zinc concentrate at Bauer, Utah.

Good Silver Market Helps Butte

Silver mines and copper, lead, and zinc mines in the West where silver is an important constituent of the ore are benefited materially by higher prices for that metal. The 72c. mark has been reached for the first time since 1922. Butte ores, both copper and zinc, contain much silver, and the increased price is one of the factors making for an improvement in the situation there. In California a new 20-in. vein of bonanza silver ore has been opened in the California Rand mine. Tonopah prospecting continues active, new work now being in hand in the eastern outskirts of the productive area. Promising developments in the western section continue. An important new silver-lead orebody is reported to have been opened in the Mountain Queen mine, at Animas Forks, in the San Juan region in Colorado. A quarterly dividend of $400,000 has been paid by the Premier, British Columbia producer, and in northern Ontario current production is around 850,000 oz. per month. Perhaps the feature of the situation in all North American silver districts is the active prospecting and development work.

Figures just issued show the gold output of Ontario for the first half of the year to be $11,810,000, an increase of about $3 000,000 over the corresponding period of last year. The current rate is still higher, slightly more than $2,000,000 per month. August output on the Rand in South Africa was 829,437 oz., which establishes a new high record for a month of normal operation. In Sinaloa, Mexico, a new dredge is to start digging well-developed placers in the Bacubirito district. A new sampling plant for custom ore recently finished at Kingman, Ariz., should stimulate gold mining by small operators in that district. The Natomas Company, of California, is re-erecting its No. 10 steel dredge at a point about 9 miles from Folsom.

Much Shaft Sinking on Gogebic Iron Range

Little improvement is apparent in the Lake Superior iron-mining country. Shipments of ore to Oct. 1 totaled 34,961,635 tons, about 11,000,000 tons below last year's record. Operators are taking advantage of slackness in current production to advance development work. On the Gogebic range, for instance, at least five shafts are being deepened. These are the Geneva—a new one; the Puritan; the Davis; the "A" shaft at the Norrie mine; and the "G" shaft at the Pabst.

The International and Mond Nickel companies at Sudbury, Ont., are producing about 4,800,000 lb. of nickel and incidentally about 2,400,000 lb. of copper monthly. The British America Co. has faded out of the picture.

Indicative of the "easiness" of the labor situation is the announcement of the Quincy Mining Co. in Michigan that it will not employ inexperienced men at underground work. This means that there are enough workers who are already familiar with mining operations so that it is not necessary to break in green men, naturally an expensive procedure. The "Labor Problem" persisted in the Michigan copper country long after it had virtually disappeared elsewhere. Certainly there is no complaint of a shortage of labor—of reasonably competent character—in any of the mining districts today, in spite of the fact that production, except in the iron-mining districts, is at a high rate.

Speakers at the Mining Congress Meeting

A. G. MACKENZIE

JESSE F. McDONALD

STANLY A. EASTON

W. MONT. FERRY

JAMES F. CALLBREATH
Sec. Amer. Mining Congress

H. W. SEAMON
Pres. Amer. Mining Congress

C. B. LAKENAN

W. J. LORING

CHARLES A. MITKE

LOUIS S. CATES

American Mining Congress in Convention at Sacramento

Heart of California Extends Picturesque Welcome to Delegates From Mining States—"Wiskerinos" Escort Easterners in Antique Vehicles—Historical Pageant and Grass Valley Miners' Glee Club Entertain Mining Men

By George J. Young
Associate Editor
By Airplane Mail Service

A COUNT of straw hats in a crowd opposite the Hotel Senator that was engaged in patiently waiting for action indicated only two individuals who retained and brazenly wore their straws. All the more remarkable was this because it was suspiciously warm—some might say hot. And it was. One would suppose that in a state like California individuality would fairly bristle on the highways and byways and would manifest its independence by being comfortable in straw-hat weather regardless of the dictates of fashion. Nevertheless, Californians are as punctilious as New Yorkers in observing the fads. Thus normality reigned in so far as straw hats are concerned at Sacramento, where the American Mining Congress held its twenty-seventh annual convention from Sept. 29 to Oct. 4.

How the Convention Was Promoted

How did the convention happen to go to Sacramento is a question that will interest many. Chiefly by audacity, I would say. Sacramento business men have a Chamber of Commerce. Included within this is a committee on mines and mining, headed by C. E. Jarvis. Jarvis and his associates started to pep up the mining industry of the state, which was limping along on one cylinder. Incidentally, they decided that it was good business to create a mining center in their city. Other and larger cities were neglectful of their duties. Headed by Jarvis, the committee went to work. Among other things they decided that the American Mining Congress should meet in their city in 1924. Gold was discovered not far from Sacramento. Grass Valley, the gold dredging fields and the Mother Lode region are only a few hours away. Historically and actually, mining is indigenous to the country north, south, and east of this focus. The committee raised money and went after the Mining Congress, and the Mining Congress gladly accepted the opportunity. Creative ability backed by energy and courage in this instance overcame all obstacles. A magnificent hotel, the Hotel Senator, was erected close to the Capitol grounds, just to show what a town of 100,000 could do in providing suitable headquarters for a convention.

An informal luncheon was held at noon on Sept. 29. Mitchel W. Nathan, president of the Sacramento Chamber of Commerce, presided. A short address, a few words, greeted the visitors. Then the Grass Valley Glee Club, an organization of tuneful miners, dressed in the rough clothes of the mines, filled the banquet hall with their melody. C. E. Jarvis welcomed the delegates. Governor Friend W. Richardson, with characteristic terseness, extended the hospitality of the state to the visitors. H. W. Seamon, president of the Mining Congress, in response said, "God knows that the mining industry needs some help in these days. This country is overproducing in some ways and underproducing in others. It is the task of the American Mining Congress to ascertain the reason for this unbalanced condition. The government did not give heed to the necessities of the gold miners. As a consequence of the advance in the cost of various supplies and labor and the low purchasing power of the dollar many mines were forced to cease operation."

President Seamon then explained the purpose of the McFadden bill and said that this bill did not involve any public expense, but sought to establish a price for gold used in the arts commensurate with that of other commodities. He asked for a reasonable price for the gold taken out by the gold producer.

Senator Shortridge, the next speaker, claimed kinship with the miners by virtue of the fact that he had worked as a blacksmith's helper in the gravel mines when he was a boy. He introduced the subject of a department of mines and mining, and said that he fathered this federal legislation and would continue to work toward the accomplishment of this purpose. He pointed out the need for the mining industry as a part of our industrial activities. That mining should prosper, a strong department of mines is essential, in his opinion.

Late in the afternoon the citizens of Sacramento took charge of the entertainment and paraded in the pageant of the "Days of '49." Past the hotel they marched in what are supposed to be costumes of those days. Picks, miner's pans, rifles of ancient vintage, pistols, red shirts, plug hats, and more than anything else, antique vehicles, were in evidence. Horses ranging from the oldest horse in California, aged forty-three years, according to the placard that hid his ribs, up to the gracefully stepping charger carrying a movie star, comprised the motive power for those who were not on their own. Old gray-beards and numerous small girls and boys brought out the contrast that furnished the "kick" of the entertainment.

During the evening a reception was held upon the Capitol grounds. The Grass Valley Glee Club were the principal entertainers. The program was varied by several addresses, one by Governor Richardson and another by President Seamon, who pointed out the need for the continuation of government founded upon the Constitution. E. J. Henning, Assistant Secretary of Labor, preached upon the good arising from the stability of money and the stability of government. Secretary Callbreath read a message from President Coolidge in which the President pointed out the need for the development of power resources.

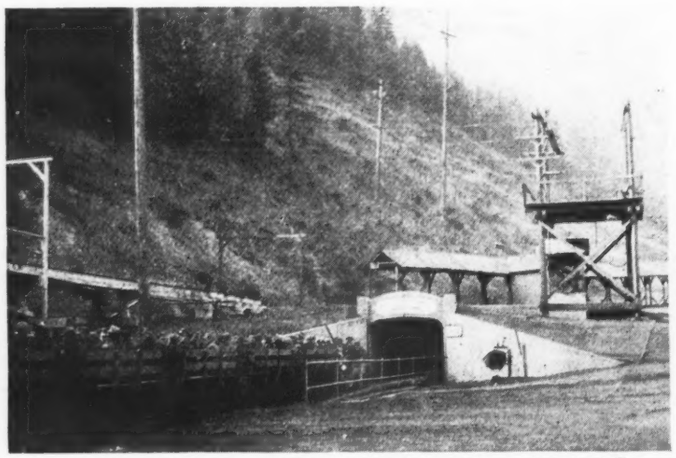
President Seamon's Address

C. E. Jarvis called the convention to order on Tuesday and turned it over to President Seamon, who presided during the morning session. The president's annual address began with the premise that there exists the greatest necessity for the people of the United States to look far into the future and to prepare now for the next fifty years. In fifty years we will have, said he, more people, and there will be no surplus of food products to export unless our farmers produce more per acre. The interrelation of industries and particularly of mining and farming was brought out. The metals are the framework of civilization, and, he said, the encouragement of the mining industry means the advancement of our civilization. The American Mining Congress is the point of diplomatic contact between the mining industry and the government. Its purpose is to assist in constructive legislation and to ward off ill-advised legislation. It already represents 85 per cent of the mineral producers.

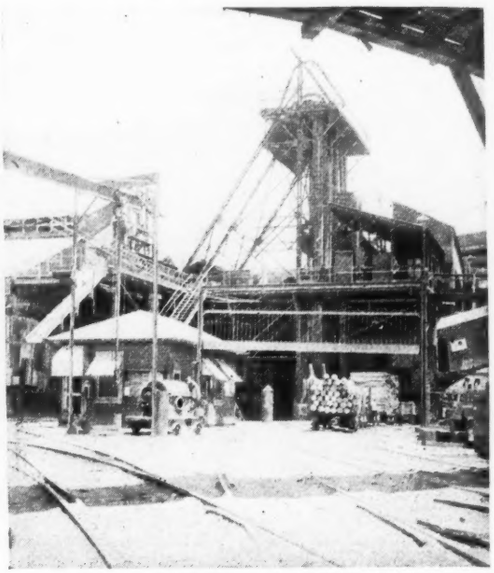
President Seamon then briefly reviewed the work of the Mining Congress and spoke of the organization of its new southern division. Skimming over the field of potential mineral resources and the development of new activities in potash, magnesium, zinc, and the rare metals, he discussed the need for the securing of adequate reserves of petroleum for naval purposes, terming this the cheapest form of insurance against war. The importance of the shale oil resources in this respect was discussed, the failure of the McFadden bill was touched upon, and the need for some balance between the cost of gold production and the price received by producers by its sale was brought to the attention of those present.

Preparedness for war is vital. An orderly supply of metals is an essential condition for preparedness. If, said President Seamon in conclusion, America is a land of glorious opportunities, even more so is it a land of impelling responsibilities.

Secretary Callbreath next read a telegram from Secretary of Commerce Hoover in which was driven home the



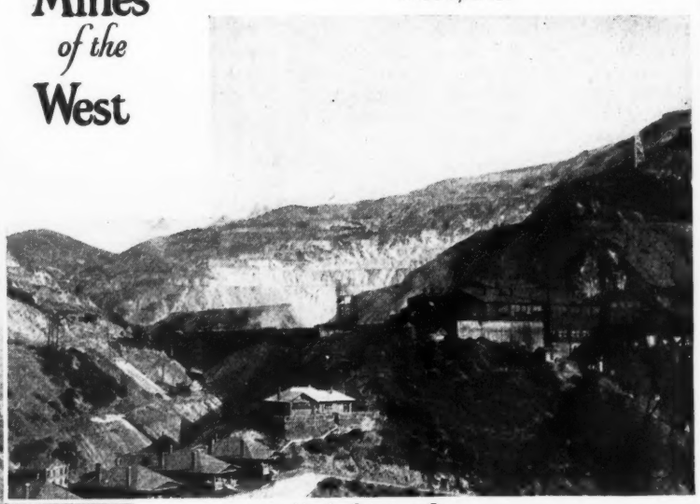
Kellogg Tunnel, Bunker Hill & Sullivan Mining & Concentrating Co.,
Kellogg, Idaho



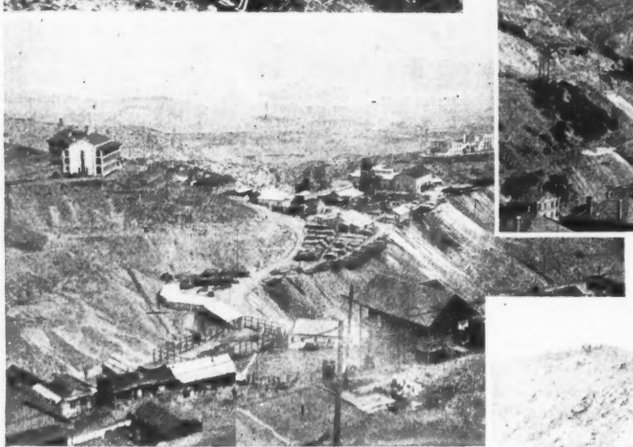
Old Dominion Mine
Globe, Ariz.

Famous Mines of the West

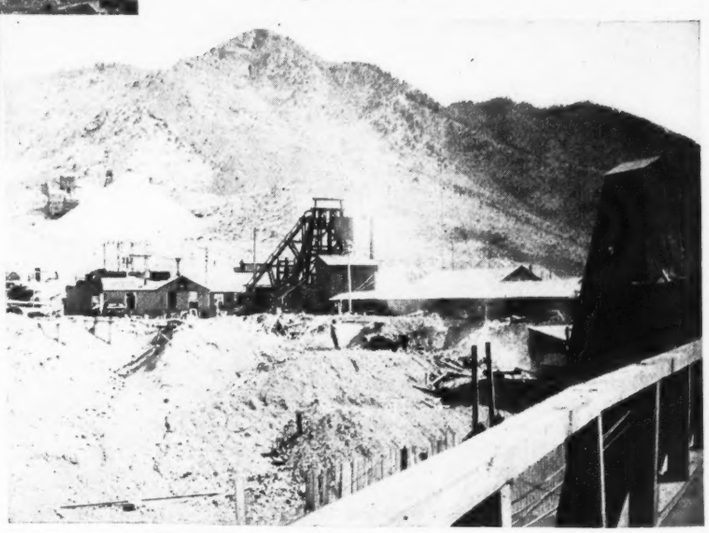
Superior Mine
Engels Copper Mining Co.
Engelmine, California



Utah Copper Co.
Bingham Canyon, Utah



United Verde Extension Mine
Jerome, Ariz



Chief Consolidated Mine
Eureka, Utah

Miami Copper Mine
Miami, Ariz.

idea that individual citizens had built up the mining industry in the past and that in the future the greatest factor for its further development will be individual initiative and collective action by the leaders of the industry.

Needs of the Industry Discussed

Senator Oddie, of Nevada, was first called and scored a home run. He advocated a Department of Mines chiefly for the reason that the mining industry is not sufficiently sponsored under present conditions. Touching upon the coal-mining industry, he said that, apart from the troubles for which the operators can be justly blamed, transportation and marketing difficulties were chiefly responsible for its present condition. He advocated the encouragement of seasonal buying and did not agree with the recommendation that the problems of the coal industry should be referred to the Interstate Commerce Commission. He stated that the silver producers had been successful in completing their organization. The work of the Senate Commission of Gold and Silver Inquiry will be continued. The mining industry is going to live and grow, he said. As an instance, Tonopah was referred to as only just beginning after a life of twenty-five years. Recently in that camp one of the largest and best orebodies was discovered below the 2,200 level. He predicted that money from old Tonopah would pour into this Western country.

Falcon Joslin, of Seattle, discussed the Alaskan situation and instanced the difficulties of those who had attempted to develop coal and petroleum prospects. He considered that the present leasing system as applied to petroleum prospecting in Alaska was too drastic. In closing he said that Alaskans wanted laws that will stabilize property rights in mineral holdings and a system of government that protects capital in its investment. Self-government is needed by Alaska.

P. G. Beckett, general manager of the Phelps Dodge Corporation, in discussing the needs of Arizona mines, said in substance: "We need a higher price for copper. The story of the copper industry in Arizona is one of overproduction, which means a low price. At the end of the war period we were left with high copper prices and high operating costs and a high rate of production. Since then high copper production inadvisedly has been maintained, the price has fallen to a low level, and is now not commensurate with its cost of production. Can we further lower costs? Not to a sufficient extent. A satisfactory wage scale has to be maintained. High freight rates rule, and these we should make every effort to have lowered. High commodity costs are also a factor. Taxes are very burdensome. If costs cannot be lowered much can we hope for a higher price? Only through a stronger demand on a smaller output. At present domestic consumption is large, and while foreign demand may increase we must not expect too much from that source. In our Arizona chapter we have discussed the possibilities of a copper tariff, but we have not reached a definite conclusion as to its desirability. There is doubt as to whether it would be helpful with the present rate of domestic production and demand, but it can well be given serious consideration. Cutting down production is the other alternative. We are in an unstable condition due to overproduction. Why deplete ore reserves at no profit? Large output keeps down the costs in the case of high- and medium-cost producers. This tendency to go on producing too much is a fault of the copper industry. What is needed in the copper industry is common sense. We are glad of helpful cooperation from governmental forces, but we do not want burdensome restrictions nor excessive taxation. Perhaps the real answer to the needs of the copper industry at the present time is a copper boll weevil. That would be as effective for us as the cotton boll weevil has been for the cotton industry."

Ex-Governor Jesse McDonald, of Colorado, said that Colorado has the same mining troubles that other Western states have. The main trouble is high cost of production and low price of metals. Nevertheless, mining, in his opinion, is on the up grade in Colorado. The tariff helped materially in the case of manganese, tungsten and other metals and eventually the old time activity will be attained.

C. E. Neslen, mayor of Salt Lake City, spoke on behalf of Utah. After discussing the position of Utah among the metal-producing states, Mr. Neslen stated that Utah needed more capital for her mines and that, in his opinion, capital should be forthcoming from the people themselves. He advocated proper advertising based upon statement of fact.

The Vanishing Prospector

In the absence of William T. Sloan, Minister of Mines of British Columbia, A. G. Langley, of his Department, read an address prepared for the convention by Mr. Sloan. In this it was stated that not as many prospectors were going into the field as formerly. The progress of civilization and the appurtenances of every-day life have worn out the glamour that once lured the prospector to distant fields. Nevertheless, he called attention to the extent of the area available in British Columbia for prospecting and the variety of mineral resources that offered opportunities for mining. Capital should be more responsive, in that it should not expect the man of small means to undertake the responsibility for a large part of the initial development. Capital should take more of the speculative chances or share equally with the prospector. He pointed out the advantages offered by the liberal mining laws and the equitable system of taxation as well as the sympathetic policy of the provincial government.

The needs of the coal-mining industry were briefly outlined by S. Pemberton Hutchinson, president of the National Coal Association. The difficulties of the coal miner are largely economic. As with the copper miner, prices are too low. The industry also needs to be let alone and it will work out its own salvation. In the opinion of Mr. Hutchinson stability of production is impracticable, as consumers' needs vary. Coal shortages have usually resulted from transportation difficulties. Nevertheless, the consumer has been able to secure a dependable supply of fuel.

Session on Federal Taxation

At the afternoon session, A. G. Mackenzie, of Salt Lake City, presided. Four excellent papers were presented, all dealing with phases of the income tax law as related to mining. McKinley W. Kreigh reviewed the changes in Federal revenue laws and income-tax procedure. Robert Buchanan, of San Francisco, discussed in detail the taxability of distributions by mining companies. A. E. Ramstedt, of Wallace, Idaho, talked on needed changes in the federal revenue law. T. O. McGrath, of Bisbee, Ariz., discussed Treasury regulations governing mining inventories. All four papers covered technicalities of the subject. R. S. Martin, internal revenue agent in charge at San Francisco, on behalf of the government discussed the difficulties of administrating the provisions of this complicated series of revenue laws. M. D. Leahy, of Seattle, presented the case of the small mine operator and showed how his conditions require changes in existing revenue laws and the regulations thereto. The stamp tax, he said, is harmful. The capital stock tax should be repealed. The small mine operator cannot command the services of experts to work out the details of his returns. In Mr. Leahy's opinion some avenue of relief must be afforded the small mine operator or speculation will cease.

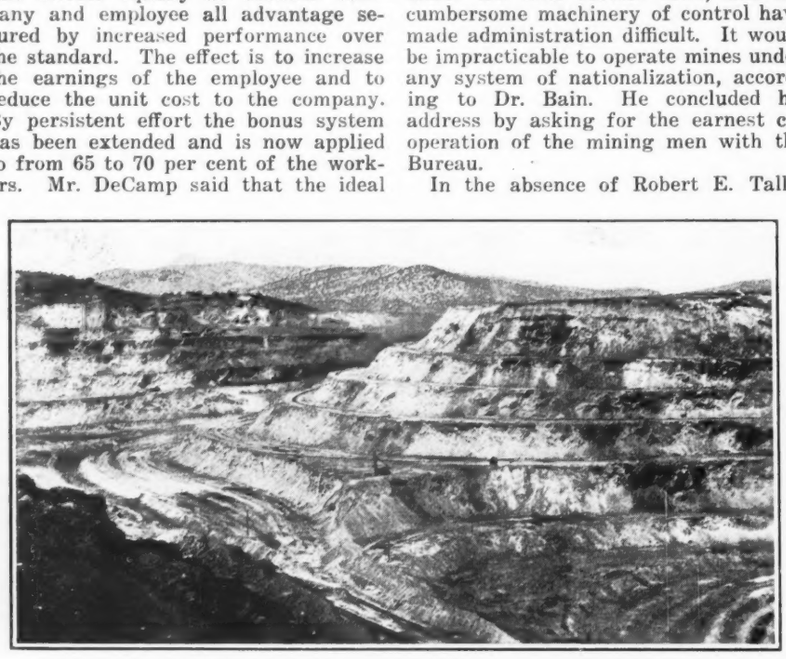
S. N. Gillen, of Los Angeles, pointed out that according to his investigation the mining industry was being discriminated against by the application of the federal revenue laws as compared with other industries. W. A. Straub, of New York, discussed the effect of the revenue laws upon the reorganization of companies, particularly mining companies.

Industrial Relations

Charles S. Knight, of the California Development Association, presided at the session on industrial relations, and after duly advertising California and his association, introduced William L. Riley, chairman of Colorado Industrial Commission. Mr. Riley described the workings of the Colorado industrial relations law, which provides for a public investigation of labor disputes as between employee and employer. The award of the commission is not binding except by agreement between both parties. It does not restrict the power of labor to strike, but requires thirty days' notice before a strike can be begun. This interval is utilized in making an investigation by the commission, which endeavors to bring both parties together and secure an agreement before real trouble starts. Compulsory investigation has decided advantages.

The next speaker, E. J. Henning, Assistant Secretary of Labor, made a general address on the subject of labor and its advancement during historical times. Incidentally, he discussed the functions of the Federal Department of Labor. W. V. DeCamp, of the United Verde Copper Co., presented a summation of the progress made by his com-

pany in establishing an equitable bonus system of labor compensation. An exhaustive study of various systems was made, as well as a thorough study of the practical details of the company's operations. As a result, standards of performance were established and the 50-50 bonus plan was adopted. In effect this method establishes a base rate of payment which is the ruling day's pay and divides equally as between company and employee all advantage secured by increased performance over the standard. The effect is to increase the earnings of the employee and to reduce the unit cost to the company. By persistent effort the bonus system has been extended and is now applied to from 65 to 70 per cent of the workers. Mr. DeCamp said that the ideal method of labor compensation as applied to mining would be to place all stoping work under the bonus system and all development under the contract system. In applying the bonus system it was found best to place the plan before the worker by personal interview. The performance rate, he said, did not attempt to include a maximum, but only an average performance by the average man. A system of proper timekeeping is essential as well as continuity in work on the bonus plan. Reports of bonus earned should be made daily or weekly. Supervision by disinterested parties is necessary, as well as the prompt settlement of disputes over earnings. A series of tables were presented showing the results of bonus earnings by different classes of labor.



Nevada Consolidated Copper Co.'s Open-cut Workings at Ruth, Nev.

Petroleum Industry Analyzed

President Seamon introduced A. G. McLaughlin, president of the Chamber of Oil and Mining of Los Angeles, and Mr. McLaughlin presented a clean-cut analysis of the petroleum industry, in which he showed that owing to the peaks and depressions, but principally to overproduction, prices are based on the law of supply and demand and have no relation to the cost of oil production. The necessity of wildcatting and for rapid drilling of new areas has resulted in excessive costs that have made the final returns of the producing companies a small percentage upon their invested capital.

H. Foster Bain, Director of the U. S. Bureau of Mines, was the next speaker, and he discussed the work of the Department of the Interior and the Bureau in relation to the mining industry. He commented upon the work of the Bureau in administering the mineral leasing laws and its interest in the safety and welfare movement. The low government pay, the restrictions imposed by the necessity of operating under the civil service laws, and the cumbersome machinery of control have made administration difficult. It would be impracticable to operate mines under any system of nationalization, according to Dr. Bain. He concluded his address by asking for the earnest cooperation of the mining men with the Bureau.

In the absence of Robert E. Tally, general manager of the United Verde Copper Co., W. V. DeCamp read Mr. Tally's paper, which discussed stability in the mining industry as being of general benefit to the workers, the industry, and to the public. The United States should seek to maintain its pre-eminence in metal production, and this will call for a change in existing conditions. The present depression in mining is due to overproduction and unsystematic marketing. There should be some means for bringing mining companies to a standard production. High taxes and the uncertain application of these taxes should be remedied. Metal prices should be such as to allow medium-cost producers to make a fair return upon their investments. The exhaustion of ore reserves at unremunerative prices makes the foreign consumer the chief beneficiary. A systematic policy of curtailment would remedy this situation. The merging of smaller mines into larger units offers another possibility, but mines should not be forced to merge in order to exist. High surtaxes discourage mining, as it is not attractive unless investors receive an adequate return on their capital investment. A reduction of surtax rates to a reasonable figure is necessary if mining is to survive.

John F. Davis, of San Francisco, presented an address in which he advocated the formation of state mining departments to co-operate with the suggested national Department of Mines. He would build a state structure similar to state departments of agriculture. A resolution favoring the general idea was introduced. Other resolutions were introduced and referred to committee.

The End of the Rainbow

Auburn entertained the Mining Congress during the afternoon and evening. The historic part of the old town was transformed into a mining camp. A giant rocker, sluice boxes, and old-timers to operate them were distributed along Auburn Creek. Many townspeople garbed in ancient miners' dress and antique costumes played the part of actors in the historical burlesque. Dancing accompanied by "fiddling" and other diversions contributed to the gayety of the occasion, which reflected credit upon everyone, including the delegates of the congress, who were submerged in the romantic atmosphere of the place.

Problems of the Gold-mining Industry

With W. J. Loring as chairman, the convention dug into the baffling gold problem on Thursday morning. Chairman Loring said that he had asked several significant questions from a number of producers and others qualified to discuss gold mining and had received replies from thirty-eight out of sixty-five requests. Practically all who answered were agreed upon the impracticability of relieving the gold-mining industry by a bonus or excise tax such as was proposed by the McFadden bill. Relative to securing relief to some extent by exempting the industry from certain taxes, there was partial agreement that something might be accomplished. A pleasing interlude took place at this point by the presentation of a paper by Prof. F. H. Probert, in which he gave the romantic history of the Yuba gold fields. C. F. Curry, one of California's representatives in Congress, followed with a candid discussion of methods suggested. He said that the constancy of the price of gold was an important advantage. "One way," he said, "that gold miners can secure help, is to go to Congress with a specific objective and they can get it, but if a number of schemes are presented, they will not get anything. If you think that gold bullion should be free from federal income tax," he said, "I believe that you can get that, and I will assist in obtaining it." He then threw a wet blanket upon the Department of Mines idea by saying that we have already too many Cabinet officers.

McFadden Plan Persists

A general discussion followed in which the McFadden idea insisted upon coming to the surface. Indeed, many still believe in its practicability and many admit the equity of the proposal but doubt its wisdom. Nevertheless, a number insisted upon the need of doing something for the gold miners. A. B. Foote, of Grass Valley, pointed out that the problems are chiefly economic and that the back swing to previous conditions will take a long time. In the meantime, he expressed the idea of driving home to the people the fact that they pay the taxes. Reduction of

taxes can come only to the people asking for less than they now do.

On Thursday afternoon the convention divided into conferences upon Taxation, on Shale Oil, on the Tariff, and Gold Producers' Problems. It is impracticable to report all of these conferences, but each was a round-table discussion of value to those interested in the separate subjects. The Standardization Conference presided over by Charles A. Mitke was especially interesting. C. B. Lakenan, of McGill, Nev., discussed "Eliminating Waste Through Standards." Reduction of costs, he said, can be effected by (1) eliminating waste; (2) standardization of equipment; (3) quantity production; (4) higher labor efficiency; and (5) reduction in wage. He dismissed the last, and said that the first four offered possibilities in specific instances. He suggested that much could be expected by the merging of manufacturing interests, to the end that fewer machines and standard parts would be turned out. H. C. Goodrich followed with a brief statement of improvements in mechanical equipment at the Utah Copper mine. E. T. Lednum, of Denver, discussed the need, from the manufacturers' standpoint, of simplifying sizes and grades of explosives so as to reduce the stock of explosives to be carried at storage points. He said that manufacturers are heartily in sympathy with any suggestion from mining companies that will reduce surplus stock to be carried in warehouses. A. S. Uhler, of the Ingersoll-Rand Co., presented the manufacturers' viewpoint by saying that although specific instances of simplification had been tried, the buyer insisted upon buying the old parts. Ill-advised efforts of mining companies to make use of only one size of drill steel for all types of drills had increased the difficulties and cost to the manufacturer. He suggested that the miners settle upon one size of steel for each type of drill as a means of cutting manufacturing costs. He instanced the constantly changing demands for small scraper hoists and asked the miners to settle upon a few standard sizes. The conference closed with the reading of reports by individual committees.

Evening Sessions on Thursday

With President Seamon in the chair, the convention listened to a paper by S. Pemberton Hutchinson on the interference of the government in bituminous coal mining. Dr. Henry M. Payne discussed governmental relation to business and Falcon Joslin showed how the extensive invasion of the government in business in Alaska was, in his opinion, responsible for adverse conditions and the dwindling population.

Friday was devoted to resolutions and election of officers. The important resolutions passed were: Recommending the adoption by state legislatures of the Colorado statute controlling sale of gold bullion; opposition to Twentieth Constitutional Amendment on child labor as invasion of state rights; extending co-operation to the Silver Producers' Association; requesting continuation of efforts to have full provisions of Pittman Act carried out; repeal of law fixing a stamp tax on stock certificates; repeal of capital stock tax; approval of Senate Bill S-3047 for the investigation of potash lands; urging the appropriation of necessary funds to complete geologic folios and reports; approval of the operation of the Fordney-McCumber tariff; recommending that surtax rates on individual incomes be reduced to a sufficient extent to stimulate investment in mining and other enterprises, and also asking for the simplification of the Federal Revenue Law; requesting the appointment of a special committee to consider changes in mineral laws that will facilitate patenting of lands upon which mineral does not outcrop, although the lands are admittedly valuable for mineral purposes; appointment of a committee to consider the stabilization of the non-ferrous metal industry; recommending the abolishment of the corporation income tax and income derived from corporations to be taxed as part of individual's income.

Directors of the American Mining Congress elected to serve three years or until their successors are elected were: H. W. Seamon, Bulkeley Wells, E. L. Doheny, and S. J. Jennings. The following officers were elected: L. S. Cates, of Salt Lake City, president; D. B. Wentz, of Philadelphia, first vice-president; E. L. Doheny, of Los Angeles, second vice-president; W. H. Lindsley, of Nashville, Tenn., third vice-president. The new executive committee is L. S. Cates, chairman; H. W. Seamon and A. J. Nason; J. F. Callbreath, secretary. Robert E. Tally was elected chairman of the board of governors, Western division.

Silver Purchases and Tariffs Discussed

Henry M. Reeves, secretary of the Silver Producers' Association, read a paper by W. Mont Ferry, of Salt Lake City, on the history of the Silver Producers' Association. It is of interest to note that two important transactions have been effected by the association, the sale of 6,000,000 oz. of silver to the Polish Government and of 4,000,000 oz. to the German Government. A. Cressy Morrison, of New York, concluded the meeting by an extremely interesting dissection of the origin of tariffs and their effect in stabilizing industry. He maintained that tariffs are fair to all and have been a basis of prosperity and protection to labor.

A report such as this must necessarily be incomplete, but the variety of topics has been indicated. There was manifested a sincere effort to bring to the surface the troublesome factors that are affecting the industry. There was unanimity of opinion that expansion of governmental activities is adversely affecting industry and that a thorough reorganization of federal taxation is necessary. The gold miners are strong in their belief that something must be done to help their industry, but a practical plan was not forthcoming. They are going to moil the subject over again and try to devise a practical plan.

The great interest in shale oil indicates that a new mining industry is in the making. Advocates of Alaska are strong in their belief that existing governmental policies with respect to their territory need fundamental change. Overproduction, stabilization, and curtailment of production are being better understood. Standardization is being advanced from the diagnostic stage to specific statement.

The attendance was in excess of 800. This is an excellent showing. The convention was a success in that it brought men together in the interest of the mining industries and by discussion it advanced the knowledge of all.

A banquet concluded the program on Friday evening, and on Saturday a number of excursions had been arranged for, of which the principal one was to Hammonton. The Yuba Consolidated Gold Fields invited the delegates to visit the gold-dredging district, and many took advantage of the invitation. Other trips were made to Grass Valley, the Mother Lode, and Coloma.

Local Chapter of A.I.M.E. Meets in Bisbee, Ariz.

The local chapter of the American Institute of Mining and Matallurgical Engineers comprising Douglas, Bisbee, and Cananea held a meeting in Bisbee, Sept. 24. Included in the program was a trip through the new Copper Queen concentrator, which was particularly appropriate, as the main subject of the meeting was "milling." W. B. Cramer, consulting metallurgist for the Phelps Dodge Corporation, delivered a paper on this phase of the mining industry. A banquet at the Warren District Country Club in the evening closed the meeting. Approximately 100 members of the Institute attended the meeting.

Meetings to Come

The California Metal and Mineral Producers' Association will hold its annual meeting in San Francisco on Oct. 22, 1924.

The fall meeting of the American Welding Society will be held in Cleveland, Oct. 30 and 31, headquarters being at the Hotel Winton.

The annual convention of the American Foundrymen's Association is scheduled for Oct. 13 to 16 in Milwaukee. The Institute of Metals Division of the A.I.M.E. will hold a meeting in Milwaukee concurrently.

The American Zinc Institute will hold the 1924 mid-year meeting of the board of directors at the Hotel Roosevelt, New York City, on Friday, Oct. 17. All members of the institute are invited to the members' conference to be held throughout the day, culminating in a dinner at 7 p.m.

The Twenty-ninth Northwest Mining Convention is scheduled for Spokane, Dec. 1-6. Samples of minerals and ore are requested from prospectors and mine owners in all parts of the Northwest. They should be shipped to Frank C. Bailey, Secretary Northwest Mining Association, 511 Chamber of Commerce Building, Spokane, Wash.

Recent Technical Publications

Reviews, Abstracts, and References

SEVERAL interesting books have accumulated on our desk in the last two or three weeks, which we shall merely mention now, hoping to be able to review them more at length within the next month. These include a two-volume work edited by Robert H. Bogue, written by various authorities, and published by McGraw-Hill, entitled "The Theory and Application of Colloidal Behavior." We note a section of more than a hundred pages covering colloids in relation to mineral products. Another new book just received, that will be of perhaps more practical application, is "Belt Conveyors and Belt Elevators," by Frederic V. Hetzel, published by Wiley. Every millman should be interested in this. A smaller volume by H. B. Pulsifer, published by the Chemical Publishing Co., is "Structural Metallography," intended for the devotees of the microscope. The Rensselaer Polytechnic Institute has sent us a book telling us all about what this, "the oldest school of science and engineering in any English-speaking country," has done in the last century.

Among the hardy perennials, we must speak first of the 1923 volume of "Mineral Industry" (McGraw-Hill), which blossomed in our office on Oct. 1, ten days earlier than last year. This is such an excellent review of all that has gone on recently in our field that we almost feel that it is unnecessary for any one to take the *Journal-Press*, except that we give most of the news first and the price is less. The 1924-25 "Engineers Guide" of the American Society of Heating and Ventilating, and the Annual Statistical Report of the American Iron and Steel Institute for 1923, have also been issued.

Walter Harvey Weed's "Mines Handbook" is anxiously awaited by many, including ourselves. This has been advertised for sale by some of our enterprising Western competitors for the last two months. A phone call to the publication office, as we are writing this, brings the information that the volume will be back from the printers and ready for cash customers one month from now.

H. M. Stationery Office, Imperial House, Kingsway, London, W. C. 2, notifies us that a list of quarries in Great Britain and the Isle of Man has just been published, containing a divisional list of quarries and mineral workings, a general index, and index of owners, and a separate index under the mineral obtained. Intending buyers should make out their money orders for 35s. 5d.

Ore roasting has become so important a part of metallurgical work that a prominent man who knows all about the subject is thinking of writing a book about it. We shall be glad to forward to him any constructive ideas or words of encouragement for such a volume that any of our readers may feel inclined to send to us. It seems to us that a book on this subject, if critical as well as descriptive, and discussing both furnaces and processes, will be very favorably received.

"Sands and Crushed Rocks" was reviewed in these columns on April 12, 1924, by Oliver Bowles, but Dr. Bowles neglected to give the name of the publisher or the price, and this information has been requested by several of our readers. This important work was published by the Oxford University Press, and may be obtained from the American Branch of this organization, at 35 West 32d St., New York City, for $17.50. The book is the most comprehensive we have ever seen upon the subject, and although its cost is high the reader is assured of more than his money's worth.

This brings to mind the fact that American technical men should congratulate themselves upon the comparatively low cost and high quality of the books issued by the leading technical publishing houses of the United States, not excepting the U. S. Government. These publishers cannot understand how their foreign contemporaries can get the prices that they ask. Of course, on books imported into the United States there is a duty of 15 per cent, but even the foreign price is high. But after all there are few books from which the reader cannot extract information worth a great deal more than the price, if the subject matter at all touches his business or profession

E. H. R.

Canadian Iron Ore—A domestic supply of iron ore has been worrying Canadians for some time. Two years ago a committee was appointed to investigate the extent and quality of the deposits of low-grade iron ores in Ontario, the best commercial methods of beneficiating them, and, generally, what steps should be adopted to enable the low-grade and other iron ores of the province to be utilized. The report of this committee has just been issued by the Department of Mines of Ontario, Toronto, as a 306-page bulletin, obtainable on request. A large amount of information is given that is of interest to any one working in this field, and an extended bibliography is appended. The committee recommends that a bounty of 1c. per unit of iron produced from Ontario deposits be paid by the government for a period of ten years; that a free export market for ore be available; and that a geologist and a mining engineer be permanently assigned to a study of the problem.

South African Mining—The thirty-fourth annual report of the Transvaal Chamber of Mines, for 1923, pp. 216, is now available from that organization, Johannesburg.

Nickel—Circular No. 100 of the U. S. Bureau of Standards, pp. 162, is entitled "Nickel and Its Alloys." This is the second edition of this book, made necessary by the number of new alloys and grades of nickel recently put on the market and the constantly increasing use of this metal in industry. An excellent bibliography is appended. Copies may be obtained for 40c. from the Superintendent of Documents, Washington, D. C.

Airplanes in Exploration—G. C. Mackenzie has contributed a detailed study of "The Use of Aircraft in Mineral Exploration and Development" to the October *Bulletin* of the Canadian Institute of Mining and Metallurgy, 603 Drummond Building, Montreal; price 50c.; pp. 31. Mr. Mackenzie views the use of airplanes for this purpose very favorably.

Suggestion Bonuses — Many plant managers offer their employees a bonus for making suggestions that will lead to a reduction in costs or greater output or that will otherwise improve plant efficiencies. The best systems are discussed in a small leaflet published by the Metropolitan Life Insurance Co., New York City, as Personnel Leaflet No. 3. No. 2 discussed vacations for employees and No. 1, holding the new employee. Any of these may be obtained free on request.

British Columbia Mining — The annual report of the British Columbia Minister of Mines for 1923 has recently been issued as a bulletin of 409 pages, obtainable free from the Bureau of Mines, Victoria, B. C.

Andalusite—The literature on andalusite is not voluminous; in fact, there may be an occasional reader who does not know that it is a silicate of aluminum. A paper on the subject by Albert B. Peck was read before the annual meeting of the Mineralogical Society of America at Washington last December and was published in the June issue of the *American Mineralogist* and in the April issue of *Mining in California*, obtainable free from the California State Mining Bureau, Ferry Building, San Francisco. About seventy tons per week of this mineral is being mined, according to Mr. Peck; it is used for the porcelain core of the most modern type of automobile spark plug.

Canadian Mineral Production—A preliminary report of the mineral production of Canada for the six months ending June 30, 1924, pp. 25, is obtainable from the Dominion Bureau of Statistics, Ottawa. The value was $37,000,000, compared with $47,000,000 for the same period in 1923.

Physical Properties of Materials—Circular No. 101 of the U. S. Bureau of Standards, second edition, has recently been issued under this title. The strengths and related properties of metals and wood are discussed in more extended and up-to-date form than can be found in the handbooks ordinarily used as a source of such information. The book will be valuable to all who are called upon to select the proper material for a certain job. The price is 40c. from the Superintendent of Documents, Washington, D. C.

Canadian Mining Laws—The Mines Branch, Department of Mines, Ottawa, Canada, has issued Bulletin No. 627, pp. 43, "The Mining Laws of Canada," a digest of the Dominion and provincial laws. It will be sent free to those interested.

Molybdenum — "Thermal Expansion of Molybdenum," by Peter Hidnert and W. B. Gero, pp. 19, has been issued by the U. S. Bureau of Standards as Scientific Paper No. 488. Copies are obtainable from the Superintendent of Documents, Washington, D. C., for 10c.

Men You Should Know About

Nichol Thompson, of Vancouver, is at Stewart, B. C.

W. de L. Benedict has returned to New York from San Francisco.

F. E. Calkins has completed an examination of the Victorio mining district, in New Mexico.

General A. E. Ross, M. P., of Ottawa, is at Stewart, B. C., in connection with his interests in the Portland Canal district.

A. I. D'Arcy, mining operator of Goldfield, has returned to Goldfield from an extended visit in San Francisco.

H. W. Hardinge has sailed again for Europe on company business. He will be away on this trip for only a month or two.

Leo Rowe is on the point of returning to India after a brief holiday in England. Captain Rowe is connected with Indian mining companies.

Daniel Harrington, formerly supervising mining engineer with the U. S. Bureau of Mines, has opened an office as a consulting mining engineer, in Salt Lake City, Utah.

Mr. and Mrs. J. V. N. Dorr, of New York City, returned on the "Berengaria," on Sept. 19, after a three months' vacation in England and various parts of the Continent.

Sir Hamar Greenwood, formerly Chief Secretary to Ireland in the British Cabinet, has recently visited the mining camps of northern Ontario, accompanied by the **Hon. J. S. Martin, J. P. Beckell,** and **G. C. Bateman.**

Walter A. Rukeyser has opened an office as a mining engineer in the Canadian Pacific Building, New York. He recently returned from an examination of properties in the Sudbury district, Ontario, and in the Rouyn district, Quebec.

Fred B. Ely recently returned from the Dutch East Indies, where he has been engaged in geological work relating to petroleum deposits. Altogether, he has spent two years in geological investigations in North Africa, Egypt, Arabia, and the East Indies.

M. H. Merriss, of the Nichols Copper Co., has recently been appointed to act as contact man between the New York office and the Laurel Hill and Linndale works of that company on all metallurgical matters, and in other ways to assist the executive vice-president, **J. B. Beaty.**

Charles E. Brewer, of Los Angeles, a prospector, recently discovered a petrified forest in the Mohave desert region of California, 35 miles north of Mohave and 6 miles from the Owens Valley road near Red Rock Canyon.

W. H. Trewatha-James, an English mining engineer, is making a tour of inspection of mining properties of the Portland Canal district, in British Columbia. Mr. Trewatha-James was actively identified with the opening up of the Mount Sicker camp, Vancouver Island, years ago, in connection with which the Ladysmith, B. C., smelter was constructed.

J. E. Spurr

J. E. Spurr, Editor in Chief, and **A. H. Hubbell,** Managing Editor, of the *Mining Journal-Press,* are traveling with the other members of the A. I. M. E. on the Southern trip of that organization through the mining fields of Tennessee and Alabama.

A. H. Hubbell

F. E. Wormser

Felix E. Wormser, assistant editor of *Mining Journal-Press,* left New York on Oct. 3 for a three weeks' field trip, in the course of which he will visit parts of southeast Missouri, Joplin, Miami, Amarillo, Bisbee, Globe, Superior and other places in the Southwest.

A. E. Flynn, professor of mining at the Nova Scotia Technical College, has been engaged by the Research Council of Canada to conduct research work on the treatment of Nova Scotia oil shales.

E. J. Ristedt, geologist for the Old Dominion company at Globe, Ariz., expects to leave soon with his family for El Oro, Mexico, where he is to do ventilation work for the Mexico mines. Mr. Ristedt has been a resident of the Globe district since 1911 and is a former employee of both the Miami and Inspiration Copper companies.

C. W. Henderson, in charge of the mineral statistics division of Denver offices of the U. S. Geological Survey, returned to that city on Sept. 21, after a two-week inspection trip in Colorado and New Mexico in company with **Frank L. Hess,** rare metal expert of the Survey. On the trip Henderson visited the petrified forests near Cripple Creek, Garos, South Park, and other Colorado points. Radium and vanadium deposits attracted special attention. In New Mexico he visited Taos, Rincanada, Elizabethtown, Red River, and Questa. Mica and radio-active ores were inspected while in the last-named region.

Obituary

James Kerr, engineer at the McCafferty mine, Herb Lake, in Manitoba, Canada, was drowned by the upsetting of a canoe on Sept. 28.

Franklin Bien, a director of the Consolidated Copper Co. and for fifty years a prominent attorney of New York, died at his home in Englewood, N. J., on Sept. 27. Mr. Bien was seventy-one years old.

Jacob Peterson, who had worked in the blacksmith shop of the Cambria-Johnstown plant of the Bethlehem Steel Corporation for nearly sixty years, is dead. So remarkable was Mr. Peterson's record, that E. G. Grace, president of the Corporation, on Oct. 7 sent to the press notices of appreciation and tribute.

John Black, a well-known mining engineer and promoter, died in Toronto, Canada, on Sept. 23. He was born in Ireland in 1871, and came to Canada early in life. After considerable mining experience in British Columbia, the United States and Mexico he went to Cobalt, where, in partnership with A. J. Foster Ross, he opened up the Crown Reserve mine. During his later years he was engaged in promoting mining enterprises.

Edward Nicklas Breitung, mine owner and mining engineer, died on Oct. 2 of heart disease at his home, 139 East 36th St., New York City, after an illness lasting a year. He was fifty-three years old. Breitung was appointed to the Foreign Lands Credit Committee by Presidents Taft and Roosevelt. He was a member of the American Institute of Mining and Metallurgical Engineers, the Bankers' Club, Whitehall Chapel, and the Republican Club. He is survived by his wife and a daughter, Mrs. Herbert William Richter, of Forest Hills, L. I. Burial was at Marquette, Mich.

New Machinery and Inventions

The Elbof Method of Electrical Prospecting

Tried in Various Parts of Europe, It Is Now Being Introduced Into the United States

GENERALLY speaking, all electrical prospecting may be said to consist of three steps—namely, producing subterranean electrical effects, upon which observations at the surface can be made; making observations upon these manifestations with suitable apparatus and recording these observations in a manner to make them available for study later; and finally in the interpretation of the field data to define the subterranean character.

On this general basis, various modes of procedure have been proposed, and some practical and successful prospecting work has been done. Most of the work, however, has had only an experimental value and could not be used for the practical prospecting of large fields.

To be of practical use in the mining field it must be possible to apply electrical prospecting for the systematical survey of large fields, and the technique must be such that the prospecting can be done in a reasonable time, even under difficult conditions, such as dense vegetation, rugged, irregular topography, or other unfavorable surface conditions.

It was with a particular view to the practical application of electrical prospecting that the Elbof method was developed, and this method of electrical prospecting has now been in practical use in Europe for several years, and many investigations have been made with it in connection with various mining properties throughout Europe. The method departs radically from other methods which have been proposed.

In the work of Professor Schlumberger and his co-workers, and that of the Swedish engineers Lundberg, Bergstroem, and others, the searching-circuit, consisting of two portable electrodes connected in series with a telephone or other detector, is used to make the field observations. These consist in taking readings of potential differences at the surface, or in locating points of equal potential, to establishing equipotential contours and current lines. Such a searching-circuit was also used by Daft and Williams in their pioneer work more than twenty years ago.

In the Elbof method the searching-circuit is not used. Instead of being observations upon the potential characteristic at the surface, the field data consist of observations upon the magnetic field, associated with the ground current. With portable apparatus designed for this purpose field data can quickly be taken, from which current lines and equipotential contours can be constructed, and which also give additional information that is valuable in defining more completely the massiveness and depth of the body that is causing a disturbance in the current field.

The apparatus for the purpose outlined and the method of procedure are covered by patent applications in America and abroad, and can be further described when these patents have come to issue. The method is being introduced in the United States by the Electrical Prospecting Corporation of America, 30 Church St., New York, of which E. E. Mueser is president.

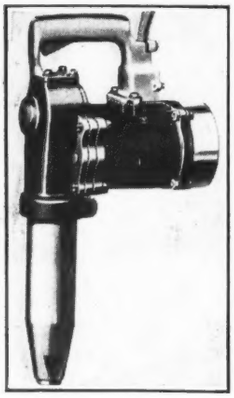
The method is said to have been developed to the point where it can be used on a wide and practical scale for the investigation of large areas. Many investigations have been made with the method throughout Europe, and in June, 1924, the first work in America with this method was begun.

The company points out that the value of practical electrical prospecting in connection with mining operations can hardly be overestimated; that it is not possible in every case to obtain valuable information by means of electrical prospecting, but that its range of usefulness is very wide, and that the time probably is not remote when a mining firm will as soon consider taking title to new property or closing a lease contract without submitting these matters for title search and legal review, as it would think of extending its mining operations or entering a new mining field without first obtaining such information upon these fields as careful electrical prospecting may yield.

Another Hammer Drill

A new electric hammer drill has recently been developed by the Chicago Pneumatic Tool Co., New York. This is known as the "Little Giant" drill and is intended for use in drilling concrete and soft stone as well as for light chipping of metals. It is equipped with a Universal motor, and will operate interchangeably on direct or alternating current. It is merely necessary to have the motor wound for the correct line voltage on which it is intended to operate.

As described by the maker, the hammer blow delivered on the drill steel or chisel is the result of energy stored up by a rapidly moving piston which is mechanically free from the impelling force. The connection between the piston and the driving mechanism is by means of air, which, at the instant the blow is delivered, restores energy to the piston through the expansion of the air which formed a cushion at the end of the up stroke. This means that there is no tendency for the electric wires or connections to be crystallized due to incessant jarring.



"Little Giant" Electric Hammer Drill

The tool is well balanced, it is said, and when held loosely in the hand, the line of center of gravity lies within the barrel of the tool and the operator's hand, causing the tool to hang vertically. A convenient trigger switch is located in the handle for the control of the electric current. The release of this switch opens the circuit, and the switch being located inside of the handle, the motor cannot be started accidentally by a blow from the outside. The bearings are all of the ball type, provision being made for lubrication of all revolving and reciprocating parts. All moving parts, including the gears, which are subject to wear, are hardened.

New Plymouth Gasoline Locomotive

The Fate-Root-Heath Co. (Plymouth Locomotive Works) Plymouth, Ohio, has just brought out a new gasoline locomotive known as Model DLC, Type 6, weighing eight tons. This locomotive is equipped with a Climax Model TU 4-cylinder engine, 5½ in. bore by 7 in. stroke, developing 65 hp. at 900 r.p.m.; a Bosch high-tension magneto with an impulse coupling; a Simms 12-volt starter and a Willard storage battery; a Stromberg carburetor; and a United air cleaner and built-in governor.

Cooling is by a Modine sectional core radiator and a 22-in. gear-driven fan. The radiator is protected by a heavy guard.

The transmission is the well-known Plymouth sliding-gear type, four-speed forward and reverse.

Axles are of alloy steel, heat treated, of extra large diameter, (4 7/16 in.). Wheels are rolled steel, 24 in. in diameter. Brakes are of the lever type to all four wheels, the only reliable method. Sand is delivered by hand to all four wheels.

This locomotive is built with a high cab, its height over all being 84 in., thus enabling the operator to see over industrial cars. The cab is provided with a side entrance, with sliding steel doors, avoiding the danger from exit between the locomotive and car, as in the case of a rear opening only.

Speeds are 2½, 4, 8, and 12 miles per hour, at an engine speed of 900 r.p.m. The draw-bar pull, at 2½ miles per hour with sand, is 6,000 lb.; at 4 miles per hour with sand, 4,800 lb.; without sand 4,000 lb.; at 8 miles per hour 2,400 lb.; at 12 miles per hour 1,600 lb.

The manufacturers report having received some remarkable reports from the development models during some long work-outs under decidedly trying conditions, so that they feel justified in recommending this new model unqualifiedly for any work within range.

The Market Report

Daily Prices of Metals

Oct.	Copper, N. Y. net refinery	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
2	12.625@12.75	48.75	49.25	8.00	7.80@7.825	6.175
3	12.75	48.25	48.75	8.00	7.80@7.825	6.175
4	12.75	48.125	48.625	8.00	7.80@7.825	6.175
6	12.75	48.50	49.00	8.00	7.80@7.825	6.175@6.20
7	12.62½@12.75	49.125	49.625	8.00	7.80	6.20
8	12.625	48.875	49.375	8.00	7.80	6.20@6.225
Av.	12.708	48.604	49.104	8.00	7.808	6.188

*These prices correspond to the following quotations for copper delivered: Oct. 2, 12.875@13c.; 3d to 6th inc., 13c.; 7th, 12.87½@13c.; 8th, 12.875c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

The quotations are arrived at by a committee consisting of the market editors of *Engineering and Mining Journal-Press* and a special representative of the Bureau of Mines and the Bureau of Foreign and Domestic Commerce.

London

Oct.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3M		Spot	3M	Spot	3M	Spot	3M
2	62⅛	63⅜	66	245¼	247½	33½	32⅞	32 13/16	32⅞
3	62¼	63¼	66¼	242¼	244½	33⅝	33	32⅞	32 15/16
6	62⅛	63	66	242	244⅜	33⅞	33⅛	32 15/16	33
7	62⅛	63	66	246	248¼	34⅛	33 7/16	33 7/16	33 1/16
8	61⅞	62⅞	65¾	244	246	34½	33½	33⅜	33

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

Oct.	Sterling Exchange "Checks"	Silver		Gold London	Oct.	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
2	4.45½	70	35 1/16	92s 8d	6	4.45⅜	70⅞	35½	92s 9d
3	4.45⅜	70⅛	35¼	92s 9d	7	4.45½	71⅜	35 1/16	92s11d
4	4.45¾	70½	35⅜	...	8	4.45½	72	36	92s11d

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command one-quarter of a cent premium.

Silver Soars to New High—Other Metals Quiet

New York, Oct. 8, 1924—Silver prices have continued the advance, and today reached 72c., the highest in more than two years. Although the price is still nowhere near that obtained when the Pittman Act was in force, American producers are well satisfied with the current level and trend and most of them are making good profits. Copper and lead were in pretty fair demand for two or three days, but in the last two days few orders have been placed. Zinc has been sold mostly for export.

Copper Slightly Weaker Today

After two or three weeks of pronounced inactivity, copper was sold in substantial volume on Thursday and Friday, a considerable amount of business being done by producers who were not willing to shade 13c. delivered. For deliveries to Pittsburgh and points west, 13⅛c. was done on several orders. On Monday, the demand slackened somewhat, though sellers remained firm at the 13c. level. Most of the larger producers continue to quote that price, but offers at 12⅞c. delivered Down East have been made yesterday and today. Those who are holding at the even figure admit that they have been unable to sell anything today; in fact, consumers do not seem to be interested at any price at the moment. Practically all of the orders placed during the week were for delivery during October, November, and December.

Foreign sales have been very satisfactory during most of the week, 13.15@13.20c., c.i.f., being done on Thursday and Friday, but today the foreign market is around 13.10c. Germany is again buying.

The matter of releasing statistics of copper consumption was settled on Monday to the satisfaction of all parties concerned. Monthly mine production figures for United States mines will be released by the American Bureau of Metal Statistics as soon as tabulated, around the middle of each month. The other data on stocks and shipments, which until recently found their way into the press, though never officially released, will be made public quarterly; that is, around the middle of this month, the figures for the third quarter of the year will be released. This arrangement will it is felt prevent misinterpretation of the situation owing to unusual conditions in any one month. Monthly mine figures indicating the activity in the producing department are fairly uniform, but stocks may go up one month and down the next.

Lead in Somewhat Better Demand

Lead prices are unchanged from those of recent weeks, though there was a slight tendency toward a fractional advance in St. Louis during the week. The demand was very fair on Thursday and Friday, and sellers found no difficulty in getting 7.825c., St. Louis, particularly for small lots. In the last day or two, however, lead has again been available in most any amount, and for any delivery within the next two months, at 7.80c., so that, although at least one prominent interest has continued to quote 7.825c., actual business at that level has not been done. The New York market continues at 8c. for all positions, with fair stocks to supply all requirements. Cable and ammunition manufacturers were perhaps the leading buyers during the week. The foreign demand is as active as ever and at comparatively high prices.

Zinc Well Taken for Export

Galvanizers did not show much interest in the zinc market during the week, but there was little pressure to sell by producers, the price continuing unsatisfactory to smelters. More than a thousand tons was sold for export during the week, and these sales have without doubt been responsible for the slight advance in prices. Japan, Italy, England, and France have bought, with some inquiries from Germany. There is also a good demand abroad for high-grade zinc, domestic prices of which continue at 8@8¼c. delivered.

Tin Advances Above 49c.

The tin market has been somewhat stronger in London, and prices here have reflected this strength, now being well over 49c. for Straits. As usual, the advance has stimulated some buying, but consumers continue suspicious and in general are willing to provide only for near-by requirements. Arrivals to and including Oct. 6 totaled 1,320 long tons.

Silver Still Advancing

After a steady advance, covering a period of several months, the silver market moved sharply upward during the last week, and today reached the highest point it has touched since June, 1922—72c. It is difficult to give precise reasons for the unusual advance, but in general it may be said that there has been buying for bear account in China, in addition to requirements in that country because of the war. India has been a moderate buyer, but does not seem to be actively following up the advance.

During the current year several European governments have reversed their position in the silver market, and instead of being sellers of silver, as in the years following the war, have turned buyers for coinage purposes. Shipments of silver against purchases earlier in the year are now being made, reducing spot supplies by the amounts of such deliveries.

At this time the London market is following the New York market, prices here being considerably above the London parity. The market appears firm at the advance.

Mexican Dollars—Oct. 2d, 53⅞c.; 3d, 54⅛c.; 4th, 54¼c.; 6th, 54½c.; 7th, 55c.; 8th, 55½c.

Exchange Movements Uninteresting

On Tuesday, Oct. 7, closing cable quotations on francs were 5.225c., and lire, 4.3475c. Canadian dollars, 1/32 per cent discount.

Other Metals

Quotations cover large wholesale lots unless otherwise specified.

Aluminum—99 per cent grade, 28c. per lb.; 98 per cent, 27c. London, £125 per long ton.

Antimony—Per lb.:
Chinese and Japanese brands, 11⅛c., nominal. Market quiet.
Cookson's "C" grade, 13¼@13½c.

Bismuth—$1.85@$1.90 per lb. London, 7s. 6d.

The recent sharp decline abroad is said to have been inspired by competition from new interests having metal of South American and Far Eastern origin. Heretofore the market has always been controlled by one firm in London, known as the Bismuth Trust. It is rumored that they now have on hand three or four hundred tons, their sales having been interfered with by outsiders. It is thought in some quarters that further sharp declines may be expected.

Cadmium—60c. per lb. London, 2s. 6d.

Iridium—$260@$270 per oz.
Iridium alloyed with platinum, $280 @$286.

Nickel—29@30c. per lb. for 99 per cent virgin metal. Electrolytic, 33c.; London, £150 per long ton.

Palladium—$80 per oz. Crude, $60.

Platinum:
Refined, $118 per oz.
Crude, $112@$114.

Quicksilver—$71 per 75-lb. flask. San Francisco wires $72.20; London, £11¾.

The prices of **Cobalt, Germanium Oxide, Magnesium, Molybdenum, Monel Metal, Osmiridium, Osmium, Radium, Rhodium, Ruthenium, Selenium, Tantalum, Tellurium, Thallium, Tungsten,** and **Zirconium** are unchanged from the prices given in the Oct. 4 issue.

Metallic Ores

Chrome — $18.50@$24, depending upon grade and source. Nominal.

Manganese — 41@45c. per long ton unit, seaport, c.i.f. Nominal.

Molybdenum — 70@75c. per lb. of MoS_2 for 85 per cent concentrates. Nominal.

Tungsten Ore—Per unit, N. Y.:
High-grade wolframite, $8.50@$8.75.
High-grade scheelite, $9.
Ordinary grades, $8.25. Nominal.

Iron Ore, Galena and **Pyrite Radio Crystals, Tantalum,** and **Vanadium Ores** are unchanged from Oct. 4 quotations.

Zinc and Lead Ore Steady and Unchanged

Joplin, Mo., Oct. 4, 1924

Zinc Blende	Per Ton
High	$44.65
Premium, basis 60 per cent zinc	$42@$42.50
Prime Western, 60 per cent zinc	$41.00
Fines and slimes	$40@$38.00
Average seettling price, all	$41.81
Lead Ore	
High	$110.80
Basis 80 per cent lead	$107.50
Average settling price, all	$106.01

Shipments for the week: Blende, 12,886; lead, 1,145 tons. Value, all ores the week, $659,420.

Some producers are charging that the talk of exporting zinc ore is responsible for the increased production. Some time may elapse before an adjustment of freight rates and settlements can be made satisfactorily for export. Foreign buyers are accustomed to purchasing on weights and assays guaranteed at the works. Sellers of this district are accustomed to receiving advance payments on ore, at times even before it is milled. There is a difference of many weeks between the two modes of settlements. An effort is being made to arrange for 90 per cent payment f.o.b. the mines, the balance for later adjustment.

Platteville, Wis., Oct. 4, 1924

Zinc	Per Ton
Blende, basis 60 per cent zinc	$44
Lead	
Lead, basis 80 per cent lead	$112

Shipments for the week: Blende, 340 tons; lead, none. Shipments for the year: Blende, 23,430; lead 800 tons. Shipments for the week to separating plants, 766 tons blende.

Non-Metallic Minerals

Magnesite — Calcined, $32@$35 per 2,000 lb. Demand falling off owing to importations.

Amblygonite, Asbestos, Barytes, Bauxite, Beryl, Borax, Celestite, Chalk, China Clay, Corundum, Diatomaceous Earth, Emery, Feldspar, Fluorspar, Fuller's Earth, Garnet, Gilsonite, Graphite, Gypsum, Ilmenite, Iron Oxide, Lepidolite, Limestone, Manjak, Mica, Monazite, Ocher, Ozocerite, Phosphate, Potash, Pumice, Pyrites, Quartz Rock Crystals, Rutile, Silica, Spodumene, Sulphur, Talc, Tripoli and **Zircon** are unchanged from Oct. 4 prices.

Mineral Products

Arsenious Oxide (white arsenic)—7c. per lb.

All of the larger United States producers are quoting 7½c. delivered, but are selling nothing. Foreign material is offered as low as 6½c. at New York, but the consumer must pay the freight to destination. Some curtailment is being made in production, owing to the stagnant market.

Copper Sulphate—4.40@4.65c. per lb.
Sodium Nitrate—$2.40 per 100 lb.

Sodium Sulphate—$17@$18 per ton, New York.

Potassium Sulphate and **Zinc Oxide** are unchanged from Oct. 4 prices.

Ferro-Alloys

Ferromanganese—$95 per gross ton.

Ferrocerium, Ferrochrome, Ferromolybdenum, Ferrosilicon, Ferrotitanium, Ferrotungsten, Ferro-uranium and Ferrovanadium are unchanged from the prices given in the Oct. 4 issue.

Metal Products

Rolled Copper—Sheets, 20½c. base; wire, 15½c.

Lead Sheets, Nickel Silver, Yellow Metal and **Zinc Sheets** are unchanged from Oct. 4 prices.

Refractories

Bauxite Brick, Chrome Brick, Firebrick, Magnesite Brick, Magnesite Cement, Silica Brick, and **Zirkite** are unchanged from Oct. 4 prices.

Iron Production and Consumption Balanced

Pittsburgh, Oct. 7, 1924

The steel market has been as active in the last week or two as at the beginning of September, but has not shown the further improvement that was expected. The steel industry continues to operate at between 55 and 60 per cent.

Finished-steel prices in the Pittsburgh district have undergone no important change in the last fortnight.

Steel consumers are operating quite well, and consumption is fully equal to present production and shipments, prospects being of increased activity in future, except for the usual slowing down in the late weeks of the year.

Pig Iron—The market is dull, with prices unchanged at $20 for bessemer, $19 for basic, and $19.50@$20 for foundry iron, f.o.b. Valley furnaces.

Connellsville Coke — The tone is a shade easier. Spot remains at $3@$3.10 for furnace and $4@$4.50 for foundry.

Stagnation in German Metal Trade

By Dr. James Rubinfeld, Berlin

ON THE EVE of the London Conference, when it became certain that Germany would be compelled to comply with the wishes of the Allies, there was a rush to cover metal requirements and to secure metallic rawstuffs from nearly every corner of the globe in anticipation of future needs. This led to sharp ordering of copper, lead, and ferro-alloys for future delivery. It seemed that American credits would help consumers in Germany to absorb the commodities. Thus it came about that in August Germany took nearly 22 per cent of all American exports of copper and set an example for other European countries, where dealers suddenly became very optimistic. Unfortunately, the presence of American bankers in Germany resulted only in a set of exceedingly limited credit transactions for German industries other than metal ones, and a few big consumers in the electrical and engineering trades are said to have come to terms with lenders with regard to credits. The dealers here have of necessity been neglected, because there exists an unheard-of lack of capital in every basic industry since the inflation depletion which claims preference in restoring normalcy here.

Market Chaotic

For lack of money the metal trade is again lifeless, consumers having in many instances no orders on their books, and metal purchased as long ago as at the end of August is being thrown upon the market several points below New York parity. This has dragged the overseas quotations themselves into the muddle, as the London houses had shared in the cheerfulness which prevailed at the Dawes Conference period and are once again now compelled to accept the existing situation in the copper market. Also, a great many of American producers have depressed the market by cheap offers to second-hand dealers. All efforts to uproot the evil have been frustrated by the financial support lent to tottering firms on the occasion of risky franc speculation in the spring of this year.

Dawes Plan Essential to Restoration of Stability

Though it is hard to foretell future developments of the German copper market, I am of the opinion that no decided revival will come in this country until the Dawes loan is finally an accomplished fact. German firms cannot transact business with other European countries, as during the inflation period, the ability to grant credit being reduced to zero. Recently the Rhineland, which is utterly devoid of stocks, and the Hamburg district, bought some small parcels of wirebars. Some business is being done in cathodes, wherein, however, German material is growing scarce owing to closing of refineries.

In lead, too, German smelters are operating at the rate of 30 per cent of capacity, and even less with regard to secondary lead, which has to play an important rôle in Germany. As a matter of fact, the shortage of lead is more apparent here than abroad. Mexican or Australian metal is, however, being resold owing to the need of funds, so the lead pipe and electrical branches are living on hand-to-mouth transactions.

Despite the announcement of cheaper fuel and freight rates which are to materialize soon, lead scrap has a very narrow market and most of the smelters of "Berliner" lead are still forced to remain closed. In Polish Upper Silesia, and Poland herself, the output of lead diminishes sensibly, owing to labor and outlet entanglements. On the other hand, the zinc-sheets trade shows some signs of recuperation, owing to the augmenting repair activities in Germany that have been so long postponed. Ingot zinc is being neglected, but, notwithstanding, it is withheld from England by the representatives of the syndicate, partly on account of the difficulties arising from the Recovery Act, but also in anticipation of improving demand in Germany.

The grievances of the dealers in and manufacturers of brass about stagnant export business continue. First-grade zinc for quality manufacture is being eagerly sought here, and a parcel of American high-grade zinc which was offered recently, after a lapse of some time, was readily bought. On the whole the sheet rollers are relatively well employed.

With regard to nickel and tungsten, consumers maintain a waiting attitude, the steel makers complaining of dwindling orders and heavy foreign competition.

Regular Mining Dividends Practically Unchanged in September

The following dividends were paid by mining and metallurgical companies during September:

Companies in the United States	Situation	Per Share	Total
American Metal	U. S. and Mexico	$0.75 Q	$402,000
American Metal pfd	U. S. and Mexico	1.75 Q	87,500
American Smelting & Refining pfd	U. S. and Mexico	1.75 Q	875,000
Calumet & Arizona, c	Ariz.	0.50 Q	321,261
Eagle-Picher Lead, l,z	Various	1.50 Q	270,000
Federal Mining & Smelting pfd., s,l	Idaho	1.75 Q	210,000
Hecla Mining, s,l	Idaho	.25 Q	250,000
Homestake Mining, g	S. D.	.50 M	125,580
Inland Steel	Minn.	0.625 Q	629,379
National Lead	Various	2.00 Q	413,108
National Lead pfd	Various	1.75 Q	426,433
St. Joseph Lead	Mo.	0.50 Q	774,684
Silver Wave Mining, s	Colo.	.....	1,000
Sloss-Sheffield Steel & Iron	Ala.	1.50 Q	150,000
Texas Gulf Sulphur	Texas	1.75 Q	1,111,250
Tintic Standard, s,l,c	Utah.	0.25 Q	287,185
U. S. Steel	Various	1.75 Q	8,895,294
United Verde Copper	Ariz.	1.50 Q	450,000
Utah Apex, l,s,g	Utah	0.25	132,000
Utah Copper	Utah	1.00 Q	1,624,490
Companies in other countries			
Chile Copper	Chile	0.625 Q	2,375,000
Hollinger Consolidated Gold	Ont.	0.05 4 wks.	246,000
Keeley Silver	Ont.	0.12 SA	240,000
Lake Shore, g	Ont.	0.05 Q	100,000
McIntyre-Porcupine, g	Ont.	0.25 T	191,500
Silversmith Mines, s,l,z	B. C.	0.01 Q	25,000
Total			$2,613,714

Q, quarterly; M, monthly; SA, semi-annually; T, every four months; c, copper; l, lead; z, zinc; g, gold; s, silver.

So far as the regular dividend payers go, there was practically no change in the September distributions from those made in the previous quarter. Nothing has been heard from Yellow Pine, so the dividend of 4c. per share paid in June was presumably not continued. Utah Apex resumed payments after a lapse of a year. Lake Shore has begun regular dividends at a rate of 5c. per share instead of 2c., as heretofore, the enlarged mill making this possible. The total dividends paid were about $1,500,000 less than in June, but this is more than accounted for by the fact that Calumet & Hecla and Mother Lode Coalition paid nothing in September, the last-named company making disbursements to stockholders only semi-annually.

Freight Rates on Metals, Ores, and Concentrates Substantially Unchanged

No changes have occurred in the rail freight rates as published on page 439 of the Sept. 13 issue of the *Mining Journal-Press*. Slight advances have, however, been made in the marine rates. From New York to Havre the rate on lead is now $4.75 per gross ton, instead of $4.25, and on copper $5, instead of $4.50. From Gulf ports to Antwerp, the rate on copper and lead is now $5 per gross ton, instead of $4.50, a similar change also having been made in the rate on copper from Gulf ports to Havre.

From Pacific Coast ports to Hongkong and Kobe the rate has been raised from $5 to $6 per short ton.

Company Report

Tonopah Belmont Development Co.

Silver; Tonopah, Nevada

A condensed statement of the operations of the Tonopah Belmont Development Co. for the quarter ended June 30, 1924, follows:

Received and receivable for ore	$208,893.93
Mining, milling, and administration expenses	155,830.39
Total net income for three months ended June 30, 1924	$53,063.54

Available Resources, Aug. 31, 1924

Due from smelter	$52,385.71
Due from others	137,447.34
Cash in banks	417,295.90
U. S. Treasury notes	100,000.00
Liberty bonds	50,031.25
Total	$757,160.20

Mining Stocks

Week Ended October 4, 1924

Stock	Exch.	High	Low	Last		Last Div.
COPPER						
Alaska-Br. Col.	N. Y. Curb	...	...	*37	.....	....
Anaconda	New York	36¼	35¼	35¾	De.15, Ja.21, Q	0.75
Arcadian Consol.	Boston	1½	1½	1½	.....	....
Ariz. Com'l	Boston	10½	10	10	Jy.19, Jy.31	0.50
Calaveras	N. Y. Curb	...	...	2	.....	....
Calumet & Arizona	Boston	49¾	47	47	Se. 5, Se. 22 Q	0.50
Cal. & Hecla (New)	Boston	15¾	14¾	15	My. 31, Jn. 16	0.50
Canario Copper	N. Y. Curb	3⅞	3¾	3¾	.....	....
Cerro de Pasco	New York	46	45	45¾	Jy. 17, Au. 1	1.00
Chile Copper	New York	32⅞	31⅝	31⅞	Se.3, Se.29, Q	0.62½
Chino	New York	19⅝	19	19¼	Sept., 1920,	0.37½
Con. Coppermines	N. Y. Curb	3¼	2⅞	2¾	.....	....
Copper Range	Boston	23¾	21½	21¾	May, 1923	1.00
Crystal Copper	Boston Curb	*65	*56	*60	.....	....
Davis-Daly	Boston	*45	*41	*45	Mar., 1920	0.25
East Butte	Boston	4	3⅞	4	Dec., 1919	0.50
First National	Boston Curb	*36	*36	*36	Feb., 1919,	0.15
Franklin	Boston	...	...	*65	.....	....
Gadsden Copper	Boston Curb	...	...	*60	.....	....
Granby Consol	New York	18⅛	17	17⅛	May, 1919	1.25
Greene-Cananea	New York	15	14⅞	14⅞	Nov., 1920	0.50
Hancock	Boston	1	1	1	.....	....
Howe Sound	N. Y. Curb	2⅛	2⅛	2⅛	Ap.1, Ap.15, Q	0.05
Inspiration Consol.	New York	25⅛	24⅝	25⅛	De.20, Ja.7, Q	0.50
Iron Cap	Boston Curb	2⅛	2⅛	2⅛	May, 1923	0.15
Isle Royale	Boston	15	15	15	Se. 1, Se. 15,	0.50
Jerome Verde Dev.	N. Y. Curb	*98	*95	*95	.....	....
Jib Consol	N. Y. Curb	*68	*55	*57	.....	....
Kennecott	New York	47¼	44⅞	45	Se.5, Oc.1, Q	0.75
Keweenaw	Boston	*80	*80	*80	.....	....
Lake Copper	Boston	...	...	1¼	.....	....
Magma Copper	New York	35⅛	33	33⅛	Jan., 1919	0.50
Mason Valley	N. Y. Curb	1⅛	1⅛	1⅛	.....	....
Mass Consolidated	Boston	1⅛	1⅛	1⅛	Nov., 1917	1.00
Miami Copper	New York	21⅞	21⅛	21⅛	No. 1 No. 15 Q	0.50
Mohawk	Boston	32⅛	30	30	Se. 22, Oc. 13,	1.00
Mother Lode Coa.	New York	7⅞	7⅛	7⅛	Jn.13, Jn.30	0.37½
Nevada Consol.	New York	14⅛	13⅛	13⅝	Sept., 1920,	0.25
New Cornelia	Boston	20¼	19⅝	20¼	Au.8, Au.25,	0.25
New Dominion	N. Y. Curb	...	...	2⅛	.....	....
North Butte	Boston	4⅛	3¼	3¼	Oct., 1918,	0.25
Ohio Copper	N. Y. Curb	1⅛	1	1⅛	.....	....
Old Dominion	Boston	20	19	19	Dec., 1918	1.00
Phelps Dodge	Open Mar.	†116	†112	...	Se.20, Oc.1 Q	1.00
Quincy	Boston	20	18	18	Mar., 1920	1.00
Ray Consolidated	New York	12⅛	11⅛	11⅜	Dec., 1920	0.25
Ray Hercules	N. Y. Curb	...	...	*20	.....	....
St. Mary's Min. Ld.	Boston	34	33⅛	33⅛	Ap.22, My.20	3.00
Seneca Copper	New York	1⅛	1⅛	1⅛	.....	....
Shannon	Boston	1	*80	*80	Nov., 1917	0.25
Shattuck Arizona	New York	6	6	6	Jan., 1920	0.25
Superior & Boston	Boston	1⅛	1⅛	1⅛	.....	....
Tenn. C. & C. cfs.	New York	7⅜	7⅛	7⅛	De.31, Ja.15, Q	0.25
United Verde Ex	N. Y. Curb	26⅛	25⅞	26⅛	Oc.3, No.1	0.50
Utah Copper	New York	77	73	73	Se.15, Se.30, Q	1.00
Utah Metal & T.	Boston	...	...	*25	Dec., 1917	0.30
Victoria	Boston	*70	*50	*50	.....	....
Walker Mining	N. Y. Curb	...	...	3	.....	....
Winona	Boston	*36	*35	*35	.....	....
NICKEL-COPPER						
Internat. Nickel	New York	18⅜	17¼	17⅜	Jy.17, Au.1, Q	1.50
Internat. Nickel pfd.	New York	89	88¼	89	Jy.7, Au.1, Q	1.50
LEAD						
Carnegie Lead & Zinc	Pittsburgh	3⅜	3¼	...	.....	....
National Lead	New York	158	150	152⅛	Se.12, Se.30, Q	2.00
National Lead pfd.	New York	117	117	117	Au. 22, Se. 15, Q	1.75
St. Joseph Lead	New York	34	30⅜	33	De. 9, De.20	0.50
ZINC						
Am. Z. L. & S.	New York	8	7⅛	7⅛	May, 1920	1.00
Am. Z. L. & S. pfd.	New York	27⅛	27	27	Nov., 1920	1.50
Butte C. & Z.	New York	5⅛	5⅛	5⅛	Mar., 1923	0.50
Butte & Superior	New York	16⅛	15⅛	16⅛	Je.15, Je. 30, Q	0.50
Callahan Zn-Ld.	New York	3¼	3	3	Dec., 1920	0.50
New Jersey Zn.	N. Y. Curb	...	...	161	Oc.,No.,'24 QX	4.00
United Zinc	N. Y. Curb	...	...	*25	.....	....
Yellow Pine	Los Angeles	...	...	56	June, 1924	0.04
SILVER						
Alvarado	N. Y. Curb	1⅛	1⅛	1⅛	.....	....
Beaver Consol.	Toronto	*19	*16	*17½	May, 1920	0.03
Castle-Trethewey	Toronto	*71	*68½	*70	.....	....
Coniagas	Toronto	1.90	1.70	1.85	Ap.20, My.1	0.02½
Crown Reserve	Toronto	*47½	*46	*47	Jan., 1917	0.05
Keeley	Toronto	2.25	2.22	2.24	Sept. 15, SA	0.12
Kerr Lake	N. Y. Curb	1⅞	1⅜	1⅜	Oc. 1, Oc. 15,	0.12½
La Rose	Toronto	*8	*8	*8	Apr., 1922	0.10½
Lorrain Trout Lake	Toronto	1.45	1.45	1.45	.....	....
McKinley-Dar.-Sav.	Toronto	*12	*11½	*11½	Oct., 1920	0.03
Mining Corp. Can.	Toronto	2.68	2.63	2.65	Sept., 1919	0.12½
Nipissing	N. Y. Curb	6⅜	6¼	6⅜	Oc.1, Oc.20, QX	0.30
Ontario Silver	New York	7¼	5⅞	7	Jan., 1919	0.50
Temiskaming	Toronto	*20	*20	*20	Jan., 1920	0.40
GOLD						
Alaska Gold	New York	*12⅛	*12⅛	*12⅛	.....	....
Alaska Juneau	New York	1¼	1⅛	1⅛	.....	....
Argonaut	Toronto	*36	*35	*35½	.....	....
Carson Hill	Boston	1	1	1	.....	....
Cresson Consol. G.	N. Y. Curb	3⅜	3⅜	3⅜	Se.30, Oc.6, Q	0.10
Dome Mines	New York	15⅜	15	15	Oc.3, Oc.20, Q	0.50
Golden Cycle	Colo. Springs	1.27	1.25	1.25	My.31, Jn.10 Q	0.03
Hollinger Consol.	Toronto	14.90	14.40	14.85	Se.18, Oc.6, M	0.05
Homestake Mining	New York	46	45¾	45¾	Se.20, Se.25, M	0.50
Kirkland Lake	Toronto	*19	*19	*19	.....	....
Lake Shore	Toronto	3.90	3.85	3.87	Se.1, Se.15, Q	0.05
McIntyre-Porcupine	New York	16	15⅞	16	Au. 1, Se. 1,	0.25
Newray	Toronto	*24½	*24	*24	.....	....
Portland	Colo. Springs	48	48	48	Oct., 1920	0.01
Teck-Hughes	Toronto	1.24	1.20	1.23	.....	....
Tom Reed	Los Angeles	19½	18	18½	Dec., 1919	0.02
Tough-Oakes	Toronto	*61	*59	*60	.....	....
United Eastern	N. Y. Curb	*35	35	*35	Jy.18, Jy.31, Q	0.05
Vipond Cons.	Toronto	1.29	1.27	1.28	.....	....
Wright-Hargreaves	Toronto	3.75	3.65	3.70	Se.15, Oc.1, Q	0.02½
GOLD AND SILVER						
Black Oak	N. Y. Curb	...	...	*89	.....	....
Con. Cortez	N. Y. Curb	*12	*12	*12	.....	....
Con. Virginia	San Francisco	8½	7½	7½	.....	....
Continental Mines	N. Y. Curb	...	...	2½	.....	....
Dolores Esperanza	N. Y. Curb	...	...	*50	Jy. 1, Jy. 10 Q	0.05
Premier Gold	N. Y. Curb	2¾	2¼	2¼	Se.25, Oc 30	0.08
Tonopah Belmont	N. Y. Curb	*60	*59	*59	Apr., 1923	0.05
Tonopah Divide	N. Y. Curb	...	...	*24	Se.22, Oc. 10	0.10
Tonopah Extension	N. Y. Curb	3⅛	3⅛	3 3/16	Se 10, Oc.1	0.05
Tonopah Mining	N. Y. Curb	1⅞	1⅞	1⅞	Se. 30, Oc. 21	0.07½
Unity Gold	N. Y. Curb	1⅛	1⅛	1⅛	.....	....
West End Consol.	N. Y. Curb	*70	*65	*70	Mar., 1923	0.05
Yukon Gold	N. Y. Curb	...	...	*50	June, 1918	0.02
SILVER-LEAD						
Ahumada	Boston Curb	6½	6	6⅛	Se.16, Oc. 2, X	0.15
Bingham Mines	Boston	16½	16½	16½	Sept., 1919	0.25
Cardiff M. & M.	Salt Lake	...	...	*75	Dec., 1920	0.15
Chief Consol.	Boston Curb	2⅞	2⅞	2⅞	Ap.19, My.1, Q	0.10
Columbus Rexall	Salt Lake	29⅛	25	27½	Aug., 1920	0.03
Consol. M. & S.	Montreal	44⅜	43½	44	Jn.30, Jy.15	0.75
Daly Mining	Salt Lake	...	...	2.00	July, 1920	0.10
Erupcion	Boston Curb	...	...	2½	Se. 15, Oc.2, X	0.15
Federal M. & S.	New York	12⅜	12⅜	12⅜	Jan., 1909	1.50
Federal M. & S. pfd.	New York	50	49¼	49¼	Au.25, Se.15, Q	1.75
Florence Silver	Spokane	8½	6½	8½	Apr., 1919, QX	0.01
Hecla Mining	N. Y. Curb	9⅜	9¼	9⅜	Sept. 15, 1924	0.25
Iron Blossom Con.	N. Y. Curb	...	...	*21	Oct., 1923	0.02
Marsh Mines	N. Y. Curb	...	...	*5	June, 1921	0.02½
Park City	Salt Lake	...	...	4.45	Se.15, Oc.1,	0.15
Park Utah	N. Y. Curb	...	...	3½	Mc.15, Ap.1	0.15
Prince Consol.	Salt Lake	*7⅛	*7⅛	*7⅛	Nov., 1917	0.02
Silver King	N. Y. Curb	...	...	*50	Se.20, Oc.1,	0.15
Silversmith	Spokane	*29	*28	*29	Oc.1, Oc.10,	0.01
Tamarack-Custer	Spokane	1.35	1.30	1.30	Se.22, Se.29,	0.25
Tintic Standard	Salt Lake	6.50	6.50	6.50	Se.1, '24, X	0.25
Utah-Apex	Boston	2⅛	2 1/16	2 1/16	Se.5, Se.15, Q	0.25
IRON						
Bethlehem Steel	New York	45	42⅜	44½	Jn.1, Jy.1, Q	1.25
Char. Iron	Detroit	...	...	*33	.....	....
Char. Iron pfd.	Detroit	*85	*50	*85	.....	....
Colorado Fuel & Iron	New York	44⅞	41⅜	42⅛	Au.11, Au. 25 Q	2.00
Col. Fuel & Iron pfd.	New York	108½	108½	108½	Feb., 1923	2.00
Gt. North'n Iron Ore	New York	30⅜	29½	29⅜	De.10, De.27	2.00
Inland Steel	N. Y. Curb	...	...	46	Au.15, Se.1 Q	0.62½
Mesabi Iron	N. Y. Curb	...	...	2½	.....	....
Replogle Steel	New York	12	11½	11½	.....	....
Republic I. & S.	New York	46	44⅜	45½	May, 1921	1.50
Republic I. & S. pfd.	New York	86	86	86	Se.15, Oc.1, Q	1.75
Sloss-Sheffield S.&I.	New York	73½	70½	71	Se.11, Se.20, Q	1.50
Sloss-Shef. S.&I.pfd.	New York	90	89	89	Se.20, Oc.1, Q	1.75
U. S. Steel	New York	109⅛	107⅞	107⅞	Se.1, Se.29 QX	1.75
U. S. Steel pfd.	New York	122⅜	122⅛	122⅜	Au. 5, Au. 30 Q	1.75
Virginia I. C. & C.	New York	...	...	71	De.15, Ja. 2	1.50
Virginia I.C.&C.pfd.	New York	...	...	89	Jn.17, Jy.1	2.50
VANADIUM						
Vanadium Corp.	New York	24¾	23	23	Jan., 1921	1.00
ARSENIC						
Western Utah Copper	N. Y. Curb	...	...	*15	.....	....
ASBESTOS						
Asbestos Corp.	Montreal	27	26⅞	26⅞	Se.29, Oc.15 Q	1.00
Asbestos Corp. pfd.	Montreal	69	68	68	Oc.1, Oc.15, Q	1.50
SULPHUR						
Freeport Texas	New York	8⅛	8	8	Nov., 1919,	1.00
Texas Gulf	New York	81	78¼	78⅜	Se.2, Se.15, QX	1.75
PLATINUM						
So. Am. Gold & P.	N. Y. Curb	4⅛	4⅛	4⅛	.....	....
MINING, SMELTING AND REFINING						
Amer. Metal	New York	47⅜	46	46¼	Au. 18, Se. 2 Q	0.75
Amer. Metal pfd.	New York	113	113	113	Au.20, Se. 2, Q	1.75
Amer. Sm. & Ref.	New York	74½	73⅛	74	Jy.11, Au. 1, Q	1.25
Amer.Sm.&Ref.pfd.	New York	104	103⅜	104	Jy.11, Au. 1,	1.25
U. S. Sm. R. & M.	New York	34⅛	32	32¼	Jan., 1921,	0.50
U.S. Sm. R.&M.pfd.	New York	45½	45½	45¾	Oc.9, Oc.15 Q	0.87½

* Cents per share. † Bid or asked. Q, Quarterly. SA, Semi-annually. M, Monthly. K, Irregular. I, Initial. X, Includes extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

Boston quotations courtesy Boston Stock Exchange; Toronto quotations those of the Standard Stock Exchange of Toronto, by courtesy of Arthur E. Moysey & Co.; Spokane, Pohlman Investment Co.; Salt Lake, Stock and Mining Exchange; Colorado Springs, Colorado Springs Stock Exchange.